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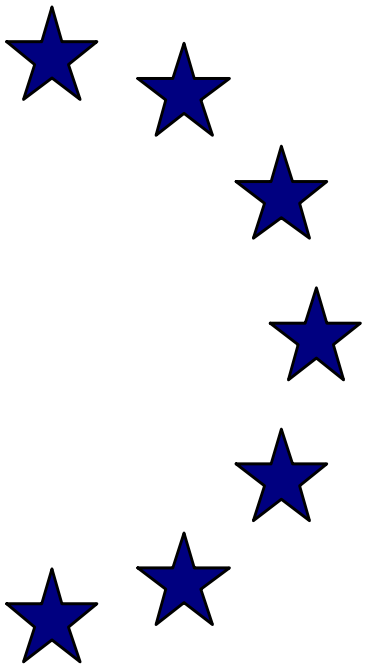

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Monitoring short-term labour cost developments in the European Union: which indicators to trust?

by
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MONITORING SHORT-TERM LABOUR COST DEVELOPMENTS IN THE EUROPEAN UNION: WHICH INDICATOR TO TRUST?

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ABSTRACT

This paper reviews the available indicators in the European Union to monitor short-term labour cost developments, i.e. of quarterly frequency, with a special focus on the euro area. It clarifies concepts, provides information on availability and compares the indicators against various statistical criteria, their historical track record and their predictive capacities. The paper mainly focuses on the supply side, particularly considering labour cost developments in terms of risks for price stability. It is found that no single indicator can be considered clearly superior and able to replace the others without loss of information, as each indicator concentrates on a specific dimension of labour costs and is affected by statistical flaws. Since indicators frequently point into different directions from a quarter to the next, the assessment of short-term wage developments should reasonably be based on the broadest available set of statistics so as to get a balanced and careful view.

The analysis of labour cost developments could be primarily based on compensation per employee given its degree of harmonisation and its broad coverage of labour costs. However, not trusting any indicator blindly and using the whole set of indicators appears to be necessary to arrive at a sound judgement of actual labour cost developments. Non-harmonised wage indicators are the timeliest, which is a key criterion for conjunctural analysis. Despite their "a priori" conceptual failures and complete lack of harmonisation, they perform relatively well compared with the more harmonised indicators available from Eurostat.

The empirical analysis shows that when forecasting core inflation one-step ahead for the euro area as a whole, the labour cost index and the ECFIN wage indicator display the higher predictive accuracy. Moreover, composite labour cost indicators (encompassing at least two indicators) clearly outperform any single wage indicator. Compensation per employee empirically appears the best, albeit weak, leading wage indicator of private consumption.

JEL classification: E21, E24, E31, E37, J30

Keywords: Labour cost indicators, wages and compensations, short-term macroeconomic developments, core inflation, private consumption, leading indicators.

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NON-TECHNICAL SUMMARY

This paper reviews the available indicators in the European Union to monitor short-term labour cost developments, i.e. of quarterly frequency, with a special focus on the euro area. It clarifies concepts, provides information on availability and compares the indicators against various statistical criteria, their historical track record and their predictive capacities. The choice of the most relevant indicator depends upon the purpose of the analysis (inflationary pressure stemming from labour cost push, firms' competitiveness and profitability, household purchasing power). The paper mainly focuses on the supply side, particularly considering labour cost developments in terms of risks for price stability.

On the basis of the analysis, it can be concluded that no single indicator can be considered clearly superior and able to replace the others without loss of information. Three reasons warrant the use of a set of indicators to monitor short-term labour cost developments:

- *First, each indicator focuses on a specific dimension of labour costs. Then, looking at the whole set of indicators may be insightful with a view to better understanding labour costs developments and their driving forces. For instance, diverging developments over several quarters could be explained by the differences of concepts, and specific components of the labour costs (e.g. negotiated wages, the wage drift or non-wage costs).*

- *Second, each indicator is affected by statistical noise and definitional flaws, which requires not trusting the short-term development in any indicator blindly. Since indicators frequently point into different directions from a quarter to the next, the assessment of short-term wage developments should reasonably be based on the broadest available set of statistics so as to get a balanced and careful view. In particular, diverging short-term developments in a context of relatively moderate wage developments might carefully be interpreted as a sign of stability in wage growth.*

- *Third, when forecasting core inflation one-step ahead for the euro area as a whole, the composite wage indicators (encompassing at least two indicators such as negotiated wage and the labour cost index) appear to be clearly superior compared with any single wage indicator. The relevance of using a composite indicator to monitor consumption appears much less obvious.*

Looking into each indicator reveals that each one has its own advantages and drawbacks, relating to its ex ante quality, ex post performance and predictive abilities:

- *Compensation per employee (COMPE) is the most comprehensive (covering all sectors) and exhaustive (covering all types of labour costs including non-wage costs) indicator to assess labour cost pressures. It is also the most harmonised indicator. Moreover, it is the relevant concept when it comes to compare labour cost growth to labour productivity developments, or, putting it differently, to compute unit labour costs (i.e. labour costs borne by a firm for each unit of output). However, the ex post analysis shows that COMPE is somewhat unstable because it is revised frequently, which also, from a more positive perspective, highlights its ability to incorporate any new pertinent information. In addition, this indicator tends to point in a different direction than the other indicators. The reason could lie in its encompassing character, which makes it sensitive to changes in the*

composition of employment (i.e. the increase of -lower-wage- part-time employment exerting some downward pressures on compensation per employee). The role of hours worked, the inclusion of public sector and the number of revisions are additional factors of divergence. The indicator does not seem to have leading properties with a view to monitoring core inflation (measured by HICP excluding unprocessed food and energy). However, including COMPE in a composite labour cost indicator (together with hourly labour costs and negotiated wages) improves the predictive accuracy compared with a single wage indicator. Moreover, COMPE empirically appears the most suited (albeit weak) leading wage indicator of private consumption, although both the sign and the magnitude of relationship between the two variables remain ambiguous.

- *The indicator of hourly labour costs (LCI) is far from perfect given the difficulty of measuring hours worked on a quarterly basis. Its strong volatility often complicates the interpretation. On the other hand, it is going through a process of improvement and harmonisation. A further value added relates to the possibility to decompose wage costs and non-wage costs. It should also be stressed that its leading properties in monitoring core inflation appears to be stronger than those of any other labour cost indicator. Moreover, the relevance of the concept of hourly labour costs, less subject to compositional effects and in particular to changes in working time, makes the LCI particularly useful when assessing wage trends over a period of one or two years, which are less affected by short-term volatility.*

- *It turned out that the non-harmonised indicators are the timeliest, which is a key criterion for conjunctural analysis. Moreover, despite their "a priori" conceptual failures and complete lack of harmonisation, they perform relatively well compared with the more harmonised indicators available from Eurostat.*

    - *The information contained in compensation per employee should be completed by that of the ECB indicator (NEGWA) of negotiated wages (for the euro area), which is characterised by a remarkable stability and indicates the wage pressures arising from wage bargaining and possible risks of second-round effects resulting from temporary inflationary hikes. Its stability arises from the fact that wages are negotiated for a period of at least one year ahead.*

    - *The ECFIN wage indicator (ECFW) shares the pattern of the ECB negotiated wage indicator, with good timeliness, poor ex ante statistical quality and good ex post performances. Moreover, used alone or as a component of composite indicators, it displays good predictive properties as regards core inflation. There is nevertheless scope for improvements as regards its construction and the regularity of its computation.*

In a nutshell, the analysis of labour cost developments could be primarily based on compensation per employee given its degree of harmonisation and its large coverage of labour costs. However, not trusting any indicator blindly and using the whole set of indicators appears to be necessary to understand their underlying components and to arrive at a sound judgement of actual labour cost developments. Moreover, any conflicting signal from other labour cost indicators would invite to cautiously conclude the absence of strong movements in labour cost growth in the very short run.

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1. INTRODUCTION

Wages have a decisive impact on inflation prospects, employment and the resilience of the economy to shocks. However, there is a striking discrepancy between the importance attached to the monitoring of wages and the accuracy with which wages can actually be monitored. This holds in particular for wage developments at the euro area level and at the intra-annual frequency. Although work on short-term wage indicators has been stepped up with the creation of the euro area, there are currently a number of different indicators in use, with sometimes conflicting signals.

Progress with labour cost indicators in terms of timeliness and accuracy has been considerable since the introduction of the euro. Data on compensation has become available in national accounts at quarterly frequency for most countries and for the euro-area aggregate. Following the implementation of a new Regulation (450/2003), the hourly labour cost index has become more harmonised and the delivery more timely. Supplementary information on employees and hours worked seems to have become more reliable.

Nevertheless, there are indications that policy makers still feel uncertain about the information on actual labour cost developments. This is specifically the case for intra-annual observations. The high volatility of the data series, the considerable size of data revisions and conflicting signals from the different available indicators confirm that the assessment of short-term labour cost developments is still subject to a sizeable degree of uncertainty. There are two further indications that there is the perception of a lack of timely quarterly wage indicators. First, the ECB established, and started to publish in 2001, its own indicator of negotiated wages, which is the least harmonised but timeliest existing indicators. Second, ECFIN has continued the calculation of its wage indicator for the euro area, which was initially foreseen as a provisional arrangement until superior official statistics become available.

This paper reviews quarterly wage indicators which are employed in the European Union for short-term analysis of labour cost developments. The objective is to provide an assessment of accuracy and limitations of the indicators in use. The paper first discusses conceptual differences of wage indicators. The second part compares the quality of the different indicators against statistical and economic criteria. That is, their quality with respect to their statistical definition and some methodological criteria are analysed (i.e. ex ante assessment), as well as their track record since the introduction of the euro (i.e. ex post assessment). The comparison of timeliness and reliability is a particularly relevant aspect, as users of these statistics should be aware of the trade-off between these dimensions. Special attention is devoted to the information-content of indicators for the euro area. Labour cost indicators of the EU-10 Member States represent a second focus of this note. More detailed information on the different wage statistics and their construction is available in the annex. This note does not touch upon the question of a suitable benchmark for wage growth. This depends on the proper measurement of productivity performance, labour market conditions and catch-up effects impacting on, for example, sectoral change.

2. CONCEPTUAL DIFFERENCES OF LABOUR COST INDICATORS

Labour cost indicators refer here to data providing quarterly information on total labour costs and their components. In this respect, gross wages are the major component, accounting for between 69% and 92% of total labour costs (see Table 1). Therefore this paper will cover here the indicators of wages and total labour costs. The main difference between the two concepts corresponds to the amount of social security paid by the employers, representing between one fourth and one third of

total labour costs in the EU. This breakdown, provided by the annual labour force surveys, cannot be used for the short-term economic analysis firstly because it is not available at quarterly frequency and secondly because the data are released with a lag varying between two and four years, depending upon the countries. Moreover, the focus of this paper is on the *growth rate* of labour costs indicators rather than their level.

Table 1: Breakdown of labour costs by main components in 2004 (annual data in percentage)

	Total economy except agriculture					Market-related sectors				
	Total wages and salaries	*of which:* Direct remuneration and bonuses	Social security paid by employer	Other labour costs	Total labour costs	Total wages and salaries	*of which:* Direct remuneration and bonuses	Social security paid by employer	Other labour costs	Total labour costs
	1	2	3	4	1+3+4	1	2	3	4	1+3+4
Belgium	n.a.	n.a.	n.a.	n.a.	n.a.	69.7	69.1	30.3	1.2	100
Czech Republic	72.2	63.3	26.7	1.2	100	71.9	63.0	26.9	2.8	100
Denmark	n.a.	n.a.	n.a.	n.a.	n.a.	87.0	70.6	10.2	0.7	100
Germany	n.a.	n.a.	n.a.	n.a.	n.a.	77.5	65.5	21.8	1.4	100
Estonia	73.3	n.a.	25.31	1.4	100	73.3	n.a.	25.3	-0.3	100
Greece (2003)	n.a.	n.a.	n.a.	n.a.	n.a.	78.8	71.7	21.7	1.7	100
Spain	73.8	n.a.	24.7	1.5	100	73.4	n.a.	24.9	4.9	100
France	n.a.	n.a.	n.a.	n.a.	n.a.	68.0	57.8	27.1	1.5	100
Italy (2002)	n.a.	n.a.	n.a.	n.a.	n.a.	69.0	62.7	29.5	0.0	100
Cyprus	85.6	85.6	14.4	0	100	84.5	84.5	15.5	0.7	100
Latvia (2003)	n.a.	n.a.	n.a.	n.a.	n.a.	78.6	72.4	20.8	0.4	100
Lithuania	72.8	66.8	27	0.3	100	71.6	66.6	28.0	0.4.	100
Luxembourg	n.a.	n.a.	n.a.	n.a.	n.a.	84.4	71.5	14.2	2.9	100
Hungary	69.3	65.2	27.5	3.1	100	69.5	65.3	27.6	2.9.	100
Malta	89.6	n.a.	10.3	n.a.	n.a.	92.2	n.a.	7.8	1.6	100
Netherlands	n.a.	n.a.	n.a.	n.a.	n.a.	76.6	66.3	21.8	3.1	100
Austria (2002)	n.a.	n.a.	n.a.	n.a.	n.a.	73.3	63.4	23.7	11.2	100
Poland	75.7	49.5	12.6	11.7	100	76.3	50.8	12.5	0.7	100
Portugal	n.a.	n.a.	n.a.	n.a.	n.a.	79.9	71.3	19.4	5.0	100
Slovenia	n.a.	n.a.	n.a.	n.a.	n.a.	80.7	65.3	14.3	1.2	100
Slovakia	73.9	62.9	25.1	1.0	100	73.7	62.8	25.1	1.5	100
Finland	n.a.	n.a.	n.a.	n.a.	n.a.	77.9	67.0	20.6	3.9	100
Sweden (2003)	n.a.	n.a.	n.a.	n.a.	n.a.	66.5	57.5	29.6	2.0	100
United Kingdom	n.a.	68	n.a.	n.a.	n.a.	80.0	69.0	18.1	1.1	100

n.a. means not available

Note: Other labour costs usually refers to small labour costs elements and include costs for vocational training or recruitment, taxes based on the wage bill and costs for working clothes minus subsidies received by the employer.
Source: Eurostat, annual labour cost survey.

2.1. Main methodological considerations and caveats with a view to comparing labour cost indicators

Four methodological remarks should be borne in mind when comparing wage indicators.

First and foremost, the usefulness of any indicator needs to be seen in conjunction with the underlying policy issue under consideration. At the onset, it may be useful to distinguish three main purposes of wage indicators. They are related to the measurement of

- labour cost growth (in both nominal terms and unit labour cost terms) in order to project inflation trends and to analyse trends in firms' profitability and competitiveness (supply side);
- developments in wages and net labour earnings in order to investigate household labour income, household purchasing power, private consumption and domestic demand (demand side);

- trends in relative costs and relative prices in order to capture adjustment to shocks and structural change in the economy.

This paper will clearly focus on the supply side, looking for the most suitable labour cost indicator(s) with a view to monitoring short-term developments in labour costs and in inflation, while also examining the demand side (i.e. outlook for private consumption). Indeed, different purposes warrant the use of different indicators with the indicator most appropriate for a specific purpose being the one that closely approximates the theoretical concept. For example, for forecasting inflation trends it would be useful to analyse nominal labour costs and unit labour costs, i.e. nominal labour cost developments adjusted for productivity. By contrast, forecasting consumption would require an indicator related to the labour income of households. The analysis of structural change would usefully rely on relative wages, where nominator and denominator are measured with a comparable methodology and undistorted from factors that influence both asymmetrically.[1]

While labour costs are often associated more with a labour-demand approach and wages more with a labour supply approach, the indicators relative to both concepts could be usefully examined together either from a labour-demand or labour-supply perspective (although with a different focus). For instance, negotiated wages are helpful indicators of pressures on labour costs coming from wage bargaining. Conversely, some indicators of labour costs could be decomposed into wage and non-wage components. Moreover, reliable indicators of labour costs are not necessarily more biased to study gross labour earnings than poor and non-harmonised indicators of labour incomes, especially in periods characterised by stability in the non-wage component of labour costs.[2] In addition, total household income will also depend upon employment growth, which is likely to be influenced by total labour cost growth.

Every purpose means different demands on the indicator with respect to coverage, harmonization, timeliness and breakdown of the data. The different requirements are especially relevant with respect to the purpose of conducting a time series analysis for one country or a cross-country analysis of developments over a specific period of time. Likewise, ex-post analysis and ex-ante forecasting also call for different statistical requirements on the indicator.

Second, the intention of this note is to evaluate quarterly wage indicators in the EU, which are used to assess recent trends in macroeconomic developments. The advantage of high frequency indicators is that they give information in a timelier manner than annual indicators. However, this comes at the cost of higher statistical noise, exposure to calendar effects, payment of bonuses etc. Moreover, the seasonal and working day adjustments, which could often have a considerable impact on the series, could even affect the year-on-year rate in case of irregular seasonal or calendar effects and make the different indicators less comparable. These adjustments are indeed not carried out for all of them or on the basis of identical adjustment techniques, leaving scope for measurement bias.

Third, the four main quarterly indicators reviewed here relate to nominal wages. Other "indirect" wage indicator, derived from nominal indicator and other economic information, might be useful such as nominal unit labour costs (ULC) or real unit labour cost (nominal ULC deflated by a price deflator such as GDP deflator). Unit labour costs measures the labour costs borne by a firm for each unit of output. In other terms, it is an indicator of nominal monthly wages deflated by productivity. Although both nominal labour cost growth and unit labour cost growth are informative on the threat posed to price stability, nominal labour cost growth appears to be more

1 For example, different trends in hours worked in manufacturing and services reduce the information content of labour costs per capita.

2 It should be noted that Eurostat just started to publish annual European sector accounts which rich information on household income. Eurostat plans to release these accounts on a quarterly basis in 2007.

useful in the short run, as unit labour costs are much influenced over the short term by the ample and cyclical movements in labour productivity growth. Therefore, although long-lasting and strong ULC growth may signal some risk of increasing inflation, short term movements in ULC remain difficult to interpret. Deflating nominal labour cost by detrended productivity growth would solve this problem but will also introduce a new one: the choice of the best detrending technique. Moreover, unlike ULC, nominal labour cost growth gives a specific indication on the labour cost pressures coming directly from the labour market and the wage bargaining process, while ULC is also influenced by product market conditions and productivity shocks.

Fourth, the interpretation of the difference between the various statistics is not so clear cut in practice, as they not only capture difference in concepts but also statistical noise and the inaccuracy of some indicators. Indeed, differences in how indicators are constructed, in what they actually measure and in the inherent measurement error can be important, sometimes as much as differences in their theoretical meaning. Well-known problems relate to the accounting of bonuses and other performance-related remuneration. It has a different importance across countries and it is difficult to identify the proper accounting period. The latter is also a problem if one-time payments are done to remunerate past work.[3] Thus, it is not always certain whether observed differences can be related to theoretical factors or whether measurement problems dominate, especially as far as short-term quarterly developments are concerned.

2.2. Difference of concepts embedded in labour cost indicators

This note compares the information content of four different indicators. These are on the one hand two harmonised concepts, Eurostat's hourly labour cost index (*LCI*) and nominal compensation per employee (hereafter *COMPE*), which is derived from the national accounts. On the other hand, non-harmonised indicators at the national level provide important additional information. Their drawback in terms of mediocre comparability across countries can be counterweighted by their ability to take country-specific circumstances into account (role of bonuses, system of wage bargaining). Despite being non-harmonised across countries, international organisations have combined these national indicators into euro-area aggregates of wages (ECFIN) and of negotiated wages (ECB, hereafter *NEGWA*).[4] The aggregated ECFIN wage indicator (hereafter *ECFW*) is based on the short-term wage statistics preferred by ECFIN country experts. Information on the indicators in use was obtained through a survey among country desks carried out in summer 2005. Detailed information about availability, construction and coverage of the different indicators is available in the annex.

3 This is for example relevant, when a new contract one with a higher wage is only agreed after the old contract had expired. In this case, lump sums are often agreed to compensate for the lack of a pay increase in the interim period.

4 For completeness, it should also be added that the OECD calculates a euro-area indicator of hourly earnings in manufacturing at quarterly frequency.

Table 2: Statistical indicators of quarterly wage developments			
	Source	**Country coverage**	**Comment**
Nominal compensation per employee (*COMPE*)	National accounts	EU aggregates, all EU-25 countries except EL, IE, LU, CY, HU, PL, PT, SI	Harmonisation through national accounts regulations
Hourly labour cost index (*LCI*)	Eurostat	EU aggregates, all EU-25 except EL (until 2005Q1) and IT (not published)	Harmonisation through EU regulation, (several Member States with derogation, all expiring in 2005)
National wage indicators (incl. *ECFW*)	Mainly national statistical offices, aggregates by ECFIN	EU-15 and euro-area aggregates, all EU-25 countries	Selected by ECFIN country desks
Negotiated wages (*NEGWA*)	ECB	Euro-area aggregate	Considered to have some leading indicator properties

Figure 1 gives a first overview of the main concepts used and conceptual differences with the four main indicators in the shadowed areas. The main reasons for differences among these main indicators are shown in the dotted boxes.

1. **Compensation per employee** (*COMPE*) captures the development in total labour costs borne by firms over a quarter. They include gross wages and salaries (i.e. wages plus employees' social security contributions) and employers' social security contributions. Employers' social security contributions drive a wedge between labour costs and wages. Moreover, this indicator covers the total economy and can be decomposed into 6 main sectors (NACE1), which gives an indication of whether labour cost developments are broadly based across sectors or whether labour cost pressure specifically comes from a particular sector or group of sector (public/private sectors; industries/services, etc.). This indicator is derived from the national accounts whereas other indicators are mostly based on surveys. It is the relevant concept when it comes to compare labour cost growth to labour productivity developments, or, putting it differently, to compute unit labour costs (i.e. labour costs borne by a firm for each unit of output).

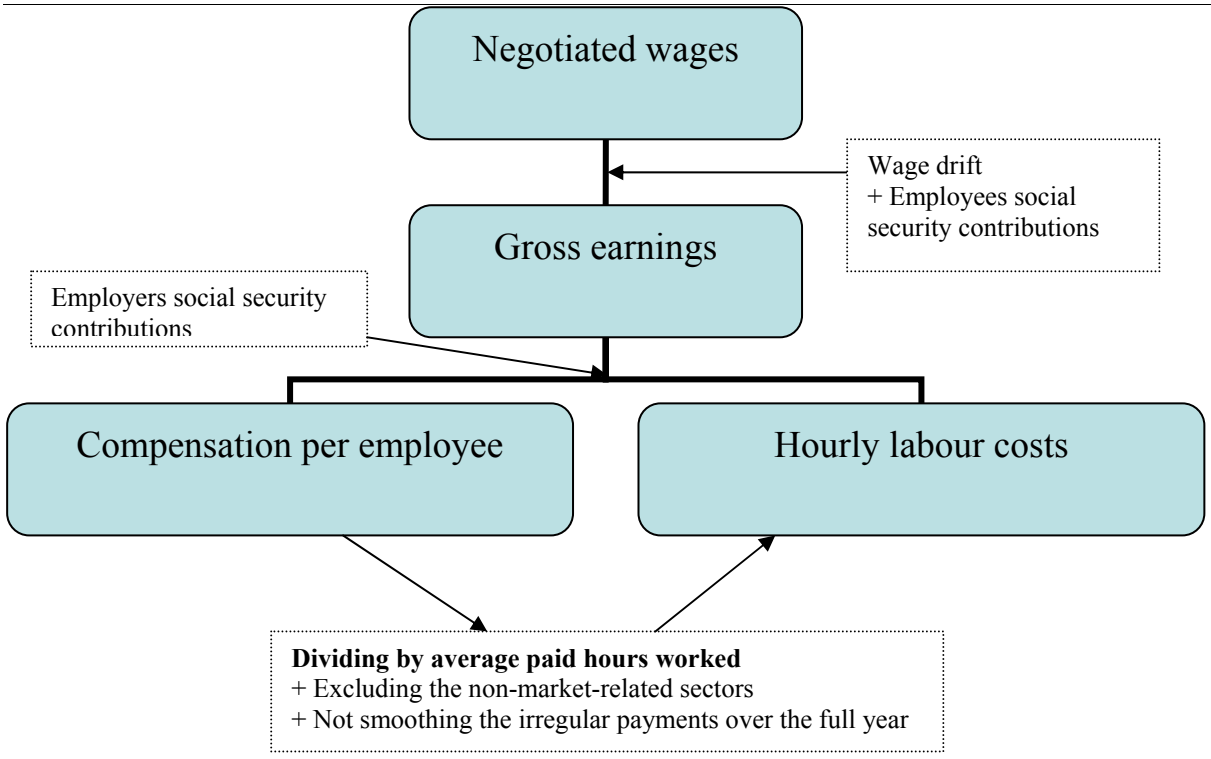
2. The **labour cost index** (*LCI*) captures the evolution in *hourly* labour costs, which is meant to give a better estimate of labour cost developments, correcting for distorting compositional effects of the numbers of paid hours worked (namely, the changes in overtime hours and the developments of part-time employment). However, the interpretation of *LCI* growth is often problematic. Indeed, since labour costs are in many cases determined on a monthly basis and not on an hourly basis, a temporary reduction of (paid) hours worked lead to high labour costs, even though total labour costs as such remain altered. This aspect also renders the concept impractical for the analysis of purchasing power and consumption, which are crucially influenced by the total number of (paid) hours worked, conditioning the total amount of earnings received in one month.

Moreover, this indicator can be broken down into wage costs and non-wages costs (mainly employers' social security contributions), from which the change in the share of non-wages costs in total labour costs can be derived. The latter is influenced by public policies such as labour market reforms, in particular those aiming at reducing labour costs at the lower end of the wage distribution, and tax measures.

Unlike *COMPE*, the information covers only the non-agricultural market-related economy ("business sectors") excluding the non-market services (administration, education, health and social services) in many countries. Moreover, the *LCI* measures the labour costs on a pay basis (i.e. monetary amounts actually paid during a given quarter) and not on an accrual basis as in the National Accounts (*COMPE)* where retroactive pay and arrears are allocated to the period they

refer to and shared out over several quarters. These payments, which often correspond to work compensation for several quarters but are made in one quarter, may render the *LCI* more volatile on a quarterly basis. Therefore, the difference between *LCI* and *COMPE* captures not only the correction of the number of hours worked but also diverging wage developments in the public and private sector and the timing of one-off payments.

Figure 1: Conceptual differences between indicators



Source: adapted by the authors from ECB (2003).

3. The **ECFIN wage indicator for the euro area and the EU-15** *(ECFW)*, based on the most timely national wage statistics, gives in general a (crude) indication of gross monthly earnings (gross wages), although underlying data for some countries refers to hourly data or to total labour costs[5]. This implies a complete lack of harmonisation of the indicator's country components. The comparison of *ECFW* with *COMPE* may tell about the development in employers' social security contributions[6]. This indicator and their country components are conceptual similar to Eurostat's indicator of gross monthly earnings, which is not produced any longer because of its lack of harmonisation and reliability.

Measures of wage growth (excluding employers' social security contributions) are regarded as a better gauge of inflationary trends because changes in social security contributions are usually one-off measures, driven by policy considerations. In the long-run, they are assumed to be shifted into wages, i.e. if total labour costs are equal to marginal labour productivity and bargaining power remains constant, higher contributions lessen wages. However, the transition to the long-term can be very protracted and therefore the short-term impact and the dynamics of adjustment can be

[5] In more than an half of the Euro area countries, the national statistics used to build the ECFIN indicator refers to measures of gross monthly wages.

[6] This indicator and their country components are conceptually similar to Eurostat's indicator of gross monthly earnings, which is not produced and published any longer because of its lack of harmonisation and reliability.

long-lasting as shown in a recent paper by Arpaia and Carone (2004). Therefore a reduction in non-wage costs may have a lasting downward effect on labour costs, while wages are maintained unchanged.

4. The **ECB indicator of negotiated wages for the euro area** (*NEGWA*) and their country components indicates the wage pressures arising from both employees' wage claims and the outcome of wage bargaining process, regardless of any governmental measures on employers' social security contributions and any "wage drift" (i.e. pay rise above or below what it is negotiated). In this respect, by comparing this information with *COMPE* (adjusted for employers' social security contributions[7]) or – *ECFW*, one can in theory derive information about **wage drift**, which is the gap between wages actually paid and negotiated wages. The wage drift integrates in particular the effect of individual promotions and individual productivity-based rewards and bonuses, but not the bonuses which have a collective nature and are the outcome of the wage negotiation (i.e. "sectoral" lump sum or profit-sharing schemes), as they are already embedded in theory in negotiated wages[8]. The stability of negotiated wages stems from the fact that wages are always negotiated for a period of at least one year. Conversely the wage drift may depend upon the change in economic conditions. In particular, it is meant to vary across the business cycle, increasing in cyclical peak and contracting in troughs.

3. AN ASSESSMENT OF THE INDICATORS

The evaluation of the different indicators is done in three steps. The first step, also called ex ante or a priori assessment, applies different statistical criteria such as timeliness, coverage, and the availability of a detailed breakdown. The second step, so-called ex post assessment, consists of an analysis of their track record. The third step involves an analysis of the link of the different wage indicators with key macroeconomic variables in the euro area, i.e. core inflation and private consumption growth. Though this last part may be considered – from an analytical perspective – as the most telling exercise, it should be stressed at the onset that the investigation is of tentative nature because the time series are simply too short to analyse the links in a thorough manner. A table in Section 4 summarises the information. Of course, such an evaluation can be subject to changes as indicators are revised or improved over time and more observations become available.

3.1. Comparison of the statistical ex ante quality of the indicators

Timeliness: Most national indicators give the timeliest indication of wage developments, as in general they are used as an input to more harmonised indicators. Even *ECFW* for the euro area and the EU-15, which assembles information from national indicators and is therefore only computed once a critical mass of countries is available, have been released a few weeks ahead of the *LCI*. The ECB indicator of negotiated wages, based sometimes on the same data for some countries, has been available at about the same time as the ECFIN indicator. The release of *COMPE* lags the *LCI*

[7] This adjustment can be done by using the development in the share of non-wages costs in total labour costs, which can be derived from the LCI breakdown between wage costs and non-wages costs. Alternatively, annual national account data can be used by dividing the annual figure for total employers' social security contribution with total compensation of employees. A third method may consist in comparing national account annual data on wages and on total compensation per employee. The last two methods are based on annual data, which is of poor relevance to correct the latest quarterly data in a timely manner. However, they can help in the analysis of past developments.

[8] It might also occur that pay rises are granted retroactively by the next bargaining round, which is captured by the wage drift.

by about a month. Conversely, *COMPE* is available with a significant lag of around three months, i.e. over one month after the timeliest indicators (*ECFW* and *NEGWA*).

Coverage: This dimension includes the sectoral coverage, the geographical scope and the availability of rich wage measures (availability of level). Another crucial aspect is the coverage of the various labour costs components. As argued in Section 2, this dimension is more an economic issue about the choice of the relevant concepts than a statistical problem.

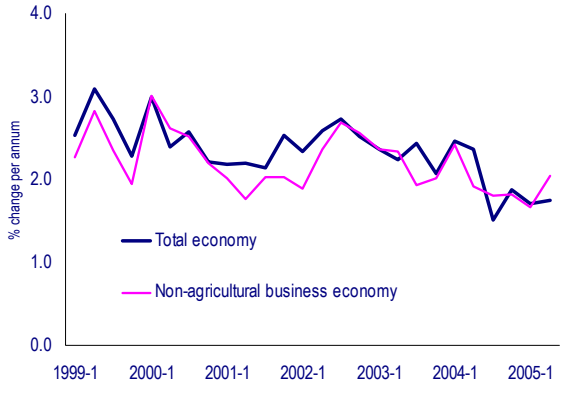
COMPE is the most comprehensive (covering all sectors) and complete (covering all types of labour costs including non-wage costs) indicator to assess labour cost pressures. The *LCI* does not capture the agricultural sector and, what is more important, data on non-market services is still missing in the majority of countries. Thus, the *LCI* captures only two-third of the economy and may give a biased picture whenever trends in the covered and the non-covered labour market segments differ[9]. As regards *ECFW*, it is difficult to give an overall assessment as the coverage differs across the different countries. While in most countries, the indicators comprise the whole economy, the focus is on the business sector only in some countries. The sectoral coverage of ECB's *NEGWA* differs likewise, due to differing number of industries covered by wage bargaining across countries and uneven statistical comprehensiveness of the indicator itself across countries. Since the indicators of negotiated wages capture only developments in collective bargaining and not total wages, they are indeed likely to provide the smallest overall coverage.[10] Moreover, the wage drift may make any indicator of negotiated wages unrepresentative for actual wage developments.

Graph 1 demonstrates that the difference between total labour costs and wages largely regards the magnitude of the growth rate but hardly the direction of a change. More marked is the impact of different sectoral coverage. This is shown in Graph 2, which compares the growth rate of *COMPE* in the total economy with a series of *COMPE* that has the same sectoral coverage as the *LCI*.

Graph 1: **Total labour costs versus wages and salaries in the LCI, euro area**

Source: Commission services.

Graph 2: **Compensation growth with different sectoral coverage, euro area**



Source: Commission services.

9 On the basis of feasibility studies, carried out in 2005, the opportunity to extend the coverage of LCI from 2007 to cover non-market services sector as well (like for COMPE) is currently examined.

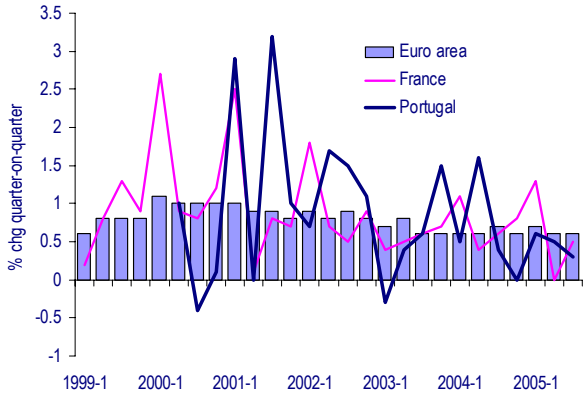
10 According OECD data, the coverage of collectively bargained wages in the euro area varies between 60% in Luxembourg and 95% in Austria, with no indications being available for Greece, Ireland. Most of the new Member States are presently not covered by OECD statistics. Those available display a much lower coverage ratio of collective bargaining, i.e. 25+ in the Czech Republic and 30+ in Hungary.

The ECFW indicator covers all countries, including the EU-10 Member States (see Box 3 on the construction of a wage indicator for the EU-10). Indeed, all EU countries have (non-harmonised) data at quarterly frequency. The *LCI* is currently published for all countries except Italy and Greece). While annual data on *COMPE* is available for all countries, quarterly data are missing for some small EU15 countries (EL, LU, PT) and are not available yet in some New Member States (CY, HU, PL and SI). Data on *NEGWA* are missing in many countries, being for example not existent in most EU-10 countries as well as in two big EU-15 countries, namely France and the UK[11], despite of good coverage of about 75% for the euro area (see Tables in the Annex).

In addition to the sectoral coverage, the geographical scope, the inclusion of all labour costs components, a relevant aspect is the existence of different dimensions. *COMPE* is the only indicator, for which comparable numbers in levels can be calculated. It is possible to calculate quarterly growth rates on the basis of working-day and seasonally-adjusted data for *COMPE* as well as for the *LCI*. As regards the two other concepts, information is only available in the form of year-on-year growth rates.

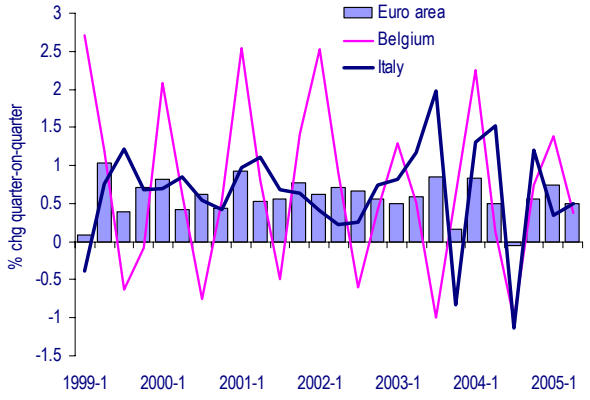
The availability of seasonally adjusted quarter-on-quarter growth rates would be more favourable to capture short-term dynamics. In practice, quarter-on-quarter growth rates have often been too volatile to be meaningfully interpreted. The exceptions are to some extent the EU aggregates, which are considerably less volatile than Member States' growth rates, suggesting a considerable smoothing through aggregation. To illustrate this point, Graphs 3 and 4 plot the quarter-on-quarter growth rate of the euro area and of two countries that had about the same average wage growth than the euro area in 1999Q1 to 2005Q2 for the *LCI* and *COMPE*, respectively.

Graph 3: **Volatility of the euro area aggregate and Member States' observations: Hourly labour cost index quarter-on quarter growth rates, wda**



Source: Commission services.

Graph 4: **Volatility of the euro area aggregate and Member States' observations: Compensation per employee, quarter-on quarter growth rates, wda**



Source: Commission services.

Harmonisation and "a priori" reliability: *COMPE* can be considered the most harmonised concept, as it complies with the requirements of national account regulations in terms of cross-country comparability and consistency with the other macroeconomic variables. EU regulations induce harmonisation of the *LCI*. In practice, data from the Member States still differs. Hours worked are not reported in all countries and estimation procedures differ. The same can be said for national data on hours worked, which are less harmonised than the *LCI*. The current lack of reliable

[11] Negotiated wage data are also missing in Denmark, Ireland and Finland. For France and Finland, proxies or estimates are used to reach around 95% of the euro area coverage.

data on hours worked severely hinders the comparability with LCI, requiring further progress in this area[12]. Therefore, *LCI* is not yet fully based on hours worked (as defined in the regulation), as some countries still use persons employed and some others utilise estimations for the hours worked. *ECFW* is a hybrid of both approaches and no correction for hourly wages has hitherto been introduced (see Box 1 for some methodological caveats related to the ECFIN indicator). The ECB's *NEGWA* is also not adjusted for the distinction between hourly data and data per employee.

Differences in the definition of national concepts also translate into the consistency of aggregate data and cross-country comparability. *ECFW* is the least harmonised concept, putting together wages per hours and per employee, actual wages and negotiated wages as well as different coverage of economic activity. Since the ECB indicator of *NEGWA* does not mix actual and negotiated wages as *ECFW* does, the aggregate can be considered as more consistent. However, *ECFW* is also based on non-harmonised national sources, which reduces its "a-priori" quality. *COMPE* and *LCI* are based on regulations that ensure cross-country comparability. Since several countries are not fully complying yet with the regulation on *LCI*, its internal consistency can still be considered weaker than that of compensation.[13] This might change in the future given the current improvement process underway and some possible further improvement, of which feasibility is currently studied by Eurostat and the Members States.

Breakdown: The *LCI* has the advantage of providing a breakdown of total labour costs into wages and salaries, and other labour costs (employers' social security contributions).[14] In the national accounts, there is not yet a breakdown of *COMPE* in wages and salaries and other labour costs at quarterly frequency.[15] No breakdown is also available of many national indicators. Negotiated wages capture by definition only agreed wages without a further breakdown.

A detailed sectoral breakdown may have advantages not only for sectoral analysis. It may also allow one to identify whether specific developments are due to events in special sectors or evenly spread across the economy. Moreover, the availability of sectoral data may be advantageous if sectoral wage growth leads wage growth in the total economy (see Box 2). Currently, the *LCI* is the most promising venue, because it offers the finest sectoral breakdown, followed by *COMPE*. The breakdown of national data is quite different. In some countries, a detailed breakdown is available whereas in some there is only a single indicator. Usually, there is a less detailed sectoral breakdown for *NEGWA* than for actual wage indicators.

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12 For instance, less that 50% of euro area has national account data on hours worked, due to the lack of reliable and consistent sources.

13 All LCI derogations expired in mid-2005, and several countries are delivering data from new sources. Overall, due to improvements in 2005, harmonisation and data quality improved significantly in the recent 4-6 quarters. However, it remains true that there are still some countries which does not-fully comply with the provisions of the regulation (e.g. GR, BE, NL, IT).

14 The LCI could also have the advantage of providing a breakdown of total labour costs into between total labour costs excluding bonuses and bonuses in the future. However, their availability and publication will be conditional upon the results of feasibility studies. Anyway, no official release is expected before Q1 2007 at the earliest.

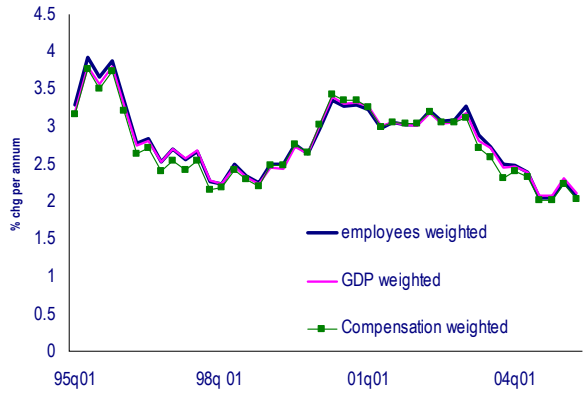
15 However, it is possible to calculate it for many EU countries from ESA National Account data, using the indicator of wages and salaries (named "D11" in the ESA classification in comparison with "D1" referring to total compensation) whenever it exists.

Box 1: Methodological caveats related to ECFIN's wage indicator (*ECFW*)

The ECFIN wage indicator (*ECFW*) has always been to be perceived a transitory concept until better indicators are in place. There are at least three reasons for continuing to compute and publish (*ECFW*). First, it is timelier. Second, as demonstrated in the main text, it fares relatively well in pointing into the correct direction. Third, since the various wage indicators often point into different directions, it is useful to have a further indicator at hand in order to identify the correct direction with more confidence. Nevertheless, there are also some inherent problems with *ECFW*. Some of them are of technical nature and relatively easy to solve. Others are of methodological nature.

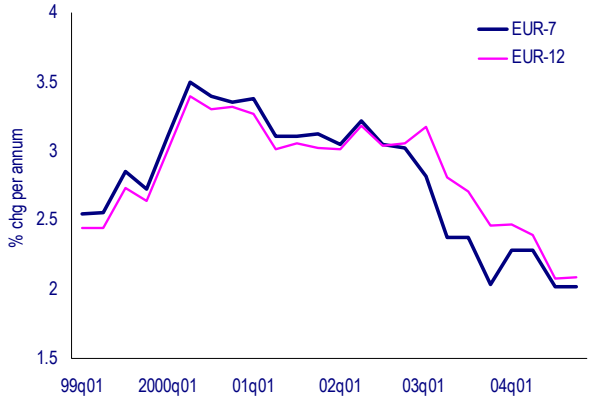
- It is calculated upon request but not in regular intervals. This for instance has led trade unions to argue on the basis of an outdated reading of the indicator in the last Macroeconomic Dialogue at technical level.
- It is relatively cumbersome to calculate because it requires country desks to collect and forward information from their country.
- It is not properly aggregated. GDP is used as a weight to build the *ECFW*, instead of employment, which is preferable from a statistical point of view. In practice, the differences are marginal. Weighing with compensation shares rather than GDP shares would, however, not yield a different time series (see Graph B.1.1).
- Missing information may lead to a bias. Setting a missing quarterly observation equal to its last observed variable instead of keeping it blank, might improve information. While countries that report data late (EL, E, IE, L, A) had only a 0.1 percentage point higher average wage growth over 1999-2005, the time profile has been different between the early reporters and the full euro area panel. This is particularly evident in 2003 (see Graph B.1.2). Once data from all countries was available, the indicator tended to be revised downwards in times of accelerating wage growth and upwards in periods of receding wage growth.
- *ECFW* summarises data with different sectoral coverage and combines hourly and per person data. Data from the five big euro area countries is on hourly basis. Hourly compensation growth has been 0.5 to 1 percentage point higher than compensation per employee in most countries. But the difference has not been steady over time, i.e. it would not be opportune to simply add the average change in working hours to the growth rate of compensation per employee to arrive at a consistent measure of wage growth per hour.

Graph B1.1: **Different weighting schemes for EUR-12 wage indicator**



Source: Commission services.

Graph B.1.2: **Early reporting countries versus total euro-area wage indicator**



Source: Commission services.

Box 2: Are wage developments in some sectors leading total economy wages?

This box only raises the issue of leading of properties of sectoral wages using simple graphical and correlation analysis. As such and in absence of hard econometric evidence, no strong conclusion should be drawn from this tentative analysis. The availability of sectoral data may be advantageous if sectoral wage growth leads wage growth in the total economy. In order whether this has been the case, the following exercise was carried out. The correlation coefficient was calculated for the growth rate of the *LCI* of the total economy excluding agriculture (NACE sectors C-O, or non-agricultural business sectors C-K if sectors L-O were not available) and the 1 quarter lagged growth rate of the manufacturing sector (sector D) and non-market services or public administration strictly speaking (sectors L-O and L, respectively). Whenever the coefficient of correlation was higher for sectoral wage growth than the coefficient of autocorrelation of the total economy growth rate, it was considered that sectoral developments carried additional information. That is, a forecast using wage growth in this sector would yield a better outcome than a random walk. The sample covered the period 1999Q1 to the most recent observation and calculated for year-on-year and quarter-on-quarter growth rates.

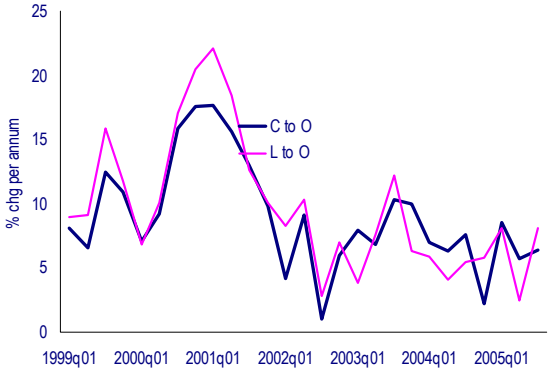
It turned out that in most countries, sectoral wage developments do not carry additional information and if they do, the value-added is small. The exceptions are for year-on-year growth rates in Hungary and Slovenia. In the former, manufacturing wages lead wage developments in the total economy. The correlation is even stronger for wages in sectors C-K, implying that non-market services wage increases seem to lag those in the rest of the economy. In Slovenia, wage increases in non-market services seem to carry some additional information. This is, however, not due to wage developments in public administration, narrowly defined (sector L). As regards, quarter-on-quarter growth rates, sectoral developments appear to carry additional information in more countries. However, coefficients of correlations are very low and in some cases even negative. Nevertheless, at least in Latvia and Portugal, it looks as if sectoral developments in non-market services help forecast total economy wage increases.

Visual inspection of the growth rates over time suggests that aggregated and sectoral specific developments point into the same direction most of the times. Also the difference in the autocorrelation coefficients is generally not large. These two indications suggest that the value-added from analysing sectoral developments in view of leading indicators for wage developments in the total economy is limited.

Graph B.2.1: **Labour cost index in Hungary**

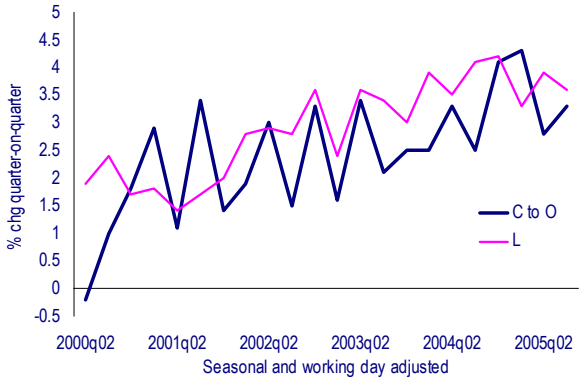
Source: Commission services.

Graph B.2.2: **Labour cost index in Slovenia**



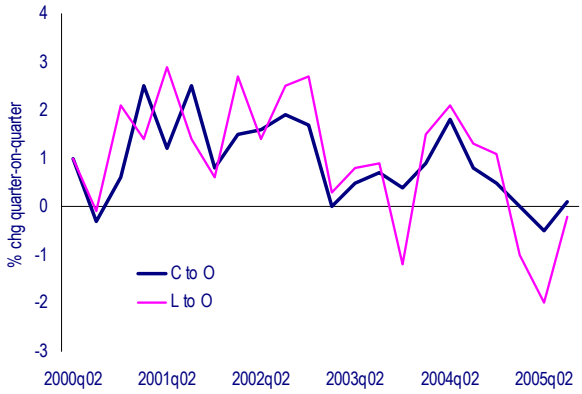
Source: Commission services.

Graph B.2.3: **Labour cost index in Latvia**



Source: Commission services.

Graph B.2.4: **Labour cost index in Portugal**



Source: Commission services.

3.2. Comparison of the ex post behaviour of the indicators

Volatility: The volatility poses two types of problems. It could be indicative of the presence of measurement flaws and statistical noises disturbing the economic meaning of the data. Alternatively, it could reflect the true pattern of the entity measured. In such a case, the concept might not be appropriate to measure the underlying trend in labour costs from a quarter to the next. Strong volatility, although not always bad per se, reduces the economic readability and interpretability of an indicator. Detrending techniques are unfortunately often of little help given the lack of long time series and the well-known end-point problem.[16]

Year-on-year growth rates of the *LCI* were quite volatile in the past. This assessment seems no longer founded after the improvements introduced in 2005. Comparing coefficients of variation (standard deviation adjusted for average growth rate) of the different labour cost indicators, displayed in Tables A1 to A3 in the annex, it appears that the national indicators (used in *ECFW*) have the lowest volatility in 11 out of the 22 reported countries, while *LCI* and *COMPE* are the least volatile indicators in 6 and 5 countries respectively.

As regards the euro area level, Table 3 shows the mean and two measures of volatility for five wage indicators. Coefficients of variation are much smaller than those of the Member States, suggesting a substantial smoothing effect through the aggregation of country developments in the euro area. The coefficients are broadly similar, being somewhat smaller for *NEGWA* and highest for the *LCI*. The ranking is not the same when the coefficients of autocorrelations are looked at, which suggests that *ECFW* is the stickiest indicator. *NEGWA* (for the euro area) is characterised by a remarkable stability given that wages are negotiated for a period of at least one year (and sometimes several years in some countries).

Table 3: Performance of quarterly wage indicators for the euro area, 1991:1-2005:2

	Average	Coefficient of variation	Coefficient of autocorrelation
Compensation per employee	2.4	0.16	0.53
Hourly labour cost index (LCI)	3.3	0.18	0.61
ECFIN wage indicator	2.8	0.14	0.88
ECB negotiated wages	2.4	0.10	0.77

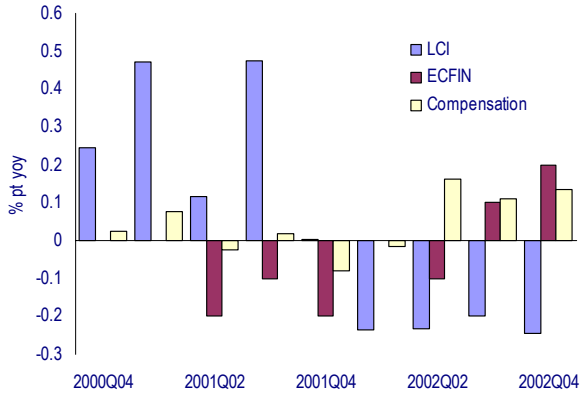
Revisions: In order to compare the extent of revisions, Graph 5 plots the difference for the observations 2000 to 2002 from summer 2003 with those from spring 2005. The end period was selected because the method of compiling the *LCI* has been changed in summer 2005, leading to a further revision, the nature of which is not comparable to past revisions. The graph reveals that revisions to the *LCI* were frequent and relatively large. This was mostly due to revisions in hours worked figures. Revisions of *COMPE* (national accounts) also were common, but relatively small and lower than *LCI* and *ECFW*, as shown by Graph 5.

An important issue is whether revisions are an unwarranted property of a wage indicator. They were unjustified if one could reasonably assume that the first estimate already gives a reliable

[16] The end-point problem particularly affects some detrending techniques (such as the HP filter or moving averages), which have a strong tendency to "overweigh" the end of the sample, distorting the calculation of the true trend.

picture. This is evidently not the case and it is better to get corrected information once it is available. The importance of revision over time signals that any new information is taken on board by Eurostat to refine the first estimate. For instance, *COMPE* is revised when the Annual National Accounts are released. Indeed, the latter serve to recalibrate the quarterly National Account, using complex statistical methodologies and various pieces of economic information (e.g. consistency check with GDP figures and tentative correction for black economy in some countries). This could explain why the revisions of *COMPE* figures are rather large, when they occur.

Graph 5: **Revisions to the wage data summer 2003 to May 2005 – euro area aggregates**



Note: The bars show the difference between the May 2005 observation for the periods shown and the observation published in summer 2003.

Source: Commission services.

Consistency of information: Though the differences in definition and coverage of the various wage indicators yield differences in their rates of growth, the broad trends are similar for the four indicators for the euro area shown in Graph 6.

However, over several periods, they point in different directions. For instance, compensation growth accelerated from 2000Q2 to 2002Q1 whereas wage growth was flat according to *ECFW* until 2003Q1. When looking at the direction of the change, one finds that these four indictors pointed into the same direction in only three quarters since 1999, i.e. in 12% of all observations. The tendency to point into different directions is also illustrated in Graph 7, which plots the change of annual growth rates from one quarter to the next from 2003 onwards for each of the four indicators. The dissimilarity is also evident in Table 4, which displays generally relatively small coefficients of correlation between them. This suggests that using *COMPE* as a benchmark and considering the other indicators as – more timely – proxies would not yield a consistent picture. The reasons could be found in the changes in the employment composition, the role of hours worked, the inclusion of public sector and number of updates. Box 3 elaborates on the causes of divergences[17].

The observed divergence between indicators is not always easy to interpret, as it could reflect both their statistical inconsistency on the negative side and their complementarities on the positive side,

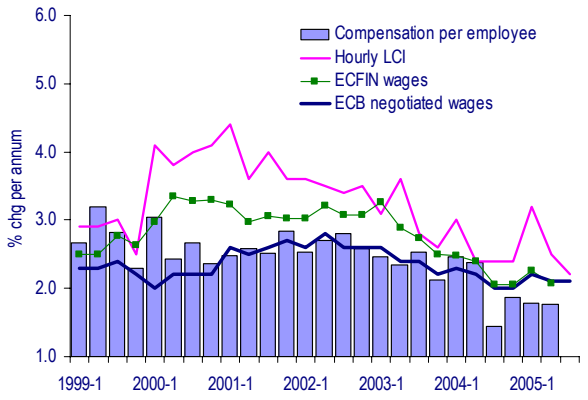
[17] Conflicting signals from different time series also exists at the Member State level, and which series is considered to give the most reliable signals seems often to depend on judgements. In order to get a flavour of the information content of wage series for some of the new Member States, Graphs A.5-A.11 in the annex show some available series for the last couple of years, assembled from different sources (Eurostat, OECD, National Statistical Offices). They show that wage growth tended to be quite volatile in the EU-10 Member States and the different indicators often point in different directions.

as already alluded to in Sections 2 and 3. Their interpretation will depend very much upon the time horizon considered:

- From a quarter to the next, the existence of diverging pattern from a quarter to the next can be seen as the absence of significant changes. It is indeed not often possible to trace back the quarterly differences between indicators to conceptual differences. From a more practical point of view, quarterly observations should be treated with caution, because of the statistical noise inherent to each indicator. Therefore, diverging short-term developments in a context of relatively moderate wage evolution might be interpreted as a sign of wage growth stability. Indeed since the run-up to the third stage of the monetary union, movements in wage growth have not been as strong as before.

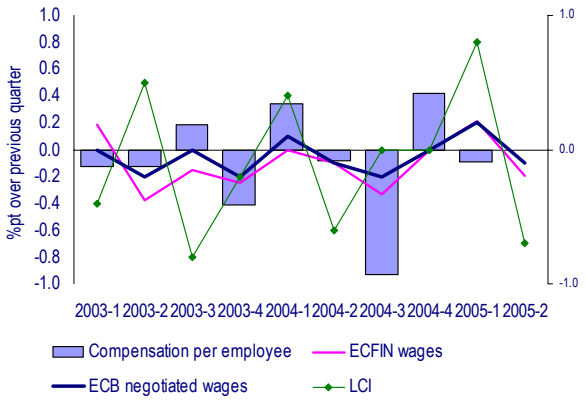
- Over several quarters (one year and longer), strong divergence deserves a thorough investigation so as to know to what extent this could be explained by the difference of concept and construction. The careful analysis of wage bargaining agreements and labour market reforms might help to identify the statistical or economic reasons behind the difference (e.g. calendar effect, existence of a special bonus/lump-sum affecting the wage bill in a specific quarter, major industrial conflict, cut or rise in social security contribution). This observation supports the idea that the analysis of wage developments should usefully be based on a broad set of indicators, as they are *complementary*, each of them capturing a specific feature of labour costs.

Graph 6: **Different wage indicators for the euro area aggregate**



Source: Commission services, ECB.

Graph 7**: Quarter-on-quarter wage growth 2003-05, euro area**



Source: Commission services.

Table 4: Cross-correlation between quarterly wage indicators for the euro area, 1991:1-2005:2

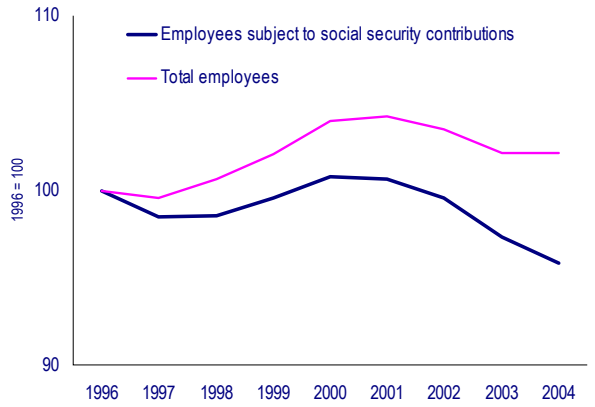
	Compensation per employee	Hourly LCI	ECFIN wages	ECB (negotiated)
Compensation per employee	1	0.46	0.59	0.48
Hourly labour cost index (LCI)	0.46	1	0.83	0.42
ECFIN wage indicator	0.59	0.83	1	0.61
ECB negotiated wages	0.48	0.42	0.61	1

Box 3: Why do actual developments in compensation per employee differ from other indicators?

Four factors might contribute to explaining the diverging developments between compensation per employee (*COMPE*) and the other indicators: the changes in the employment composition, the role of hours worked, the inclusion of public sector and number of updates.

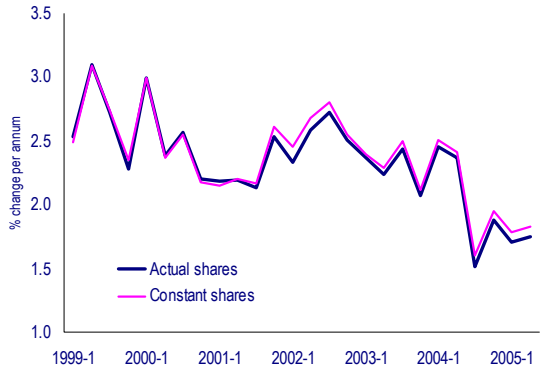
Changes in the composition of employment. The different indicators are exposed to changes over time of the structure of employment and it is a priori not evident how to assess this sensitivity. An ideal wage index would compare the change of wages between two points of time for persons doing the same job. In practice, however, workers enter or exit employment. They change working hours, jobs or sectors. The existing indicators capture these changes to a varying degree. They can have important consequences if there are special trends as for example the expansion of low-wage jobs in Germany in 2005 (employees not subject to social security contributions in Graph B.3.1). Jobs that are not subject to social security are included in the national accounts, but not necessarily captured by the surveys that are used to calculate the other wage indicators. The wage growth of *COMPE* has therefore been smaller than the increase of wages paid to those people that have remained in their job. *COMPE* does not correct for changes in the size or structure of employment. The *LCI* did partly correct for this, i.e. to the extent that the sectoral composition was held constant. While the total wage bill is divided by total hours worked for each sector, the 2000 sector shares in compensation of employees were used (up until 2005) for the aggregation of sectors to the total economy rather than the current share of sectors. Graph B.3.2 shows that the difference between constant and actual shares is small when the different weighting schemes are applied on compensation per employee. Earnings indices are likely to be less sensitive to these changes especially if they cover only selected parts of the economy such as manufacturing. Negotiated wages are probably least sensitive to changes in the composition of employment because in many countries they are bargained by trade unions in the primary interest of those workers that are in employment and likely to stay in employment.

Graph B.3.1: **Change in the structure of employment in Germany**



Source: Commission services.

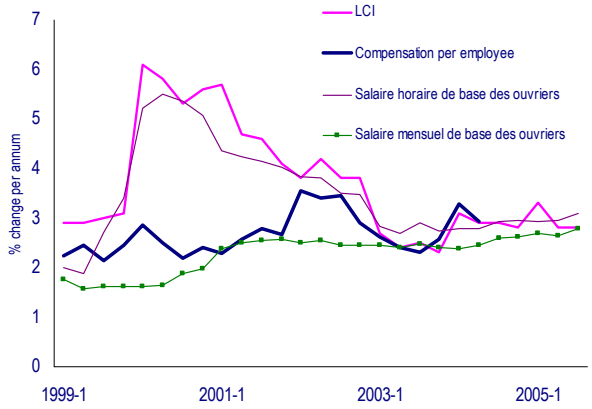
Graph B.3.2: **Actual compensation per employee and fixed-weights compensation per employee, euro area**



Source: Commission services.

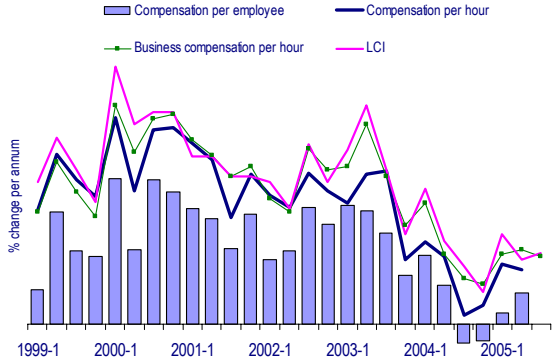
The impact of changes in hours worked. Another important intervening factor has been the trend decline in hours worked, which drive a wedge between hourly and per head wages. Consequently, wage growth according to the hourly *LCI* tends to be higher than that of *COMPE*. A clear case has been the reduction of working time in France shown in Graph B.3.3. In 2001 and 2002, per hour and per head indicators display a different direction of wage trends. Germany is one of the few countries for which (paid) hours worked are available at the quarterly frequency in the national accounts and where National Accounts are used to compute LCI. Graph B.3.4 illustrates s this by showing that adjusting *COMPE* for the difference between hours worked and persons employed as well as for the different sectoral coverage of the *LCI* yields a time series (business compensation per paid hour) that is almost equivalent to the *LCI* (with the remaining differences deriving from specific and small statistical adjustments). Earnings indices usually refer to full-time employment or full-time equivalents. Thus, they are less sensitive to changes in the composition of employment towards part-time jobs or occasional employment then compensation per employee. Note, however, that the definition of full-time equivalent is not uniform across countries.

Graph B.3.3: **Wage indicators in France: Changes in working time explain difference**



Source: Commission services.

Graph B.3.4: **Wage indicators in Germany: hours and sectoral composition explain difference**



Source: Commission services.

There is a priory no superiority of per head or per hour data, which only depends on the need and the use of the data. Payment modalities differ across sectors and countries. Therefore it is difficult to consider one series to be better suited as a benchmark than the other. Two special problems with hourly data should, however, be noted. First, hourly indicators are more sensitive to changes in the cyclical situation. Both salaries and hours worked tend to increase in a boom and decline in a slowdown, as working hours, rather than employment, often play the role of adjustment variable at the start of a slowdown or a recovery. Depending of the relative cyclicality of nominator (wages) and denominator (hours worked), hourly wage growth behaves either pro-cyclical or a counter-cyclical. Secondly, data on hours worked are more difficult to measure and therefore seem to be less reliable than those per employee. If the final objective is to relate wage data with labour productivity to arrive at unit labour costs, data per employee might be more opportune because national accounts do not yet publish GDP per hour worked at quarterly frequency.

The inclusion of the public sector. *COMPE* covers all sectors including the non-market related sectors (public administration, education, social and health services, etc). Wages in the non-market related sectors does not necessarily follow those in the market-related sectors, as it is determined by budgetary constraints and specific wage bargaining.

The number of updates. The comparison is to some extent biased against compensation per employee. This indicator is revised in a period of up to 2/3 years after the relevant quarters, while the other indicators, especially ECB's *NEGWA* and *ECFW*, are less often revised (or even never revised for the ECB indicator). Therefore, it would be more accurate to compare the labour cost indicators with *COMPE* growth at the very moment when it is released for the first time (without future revisions) but the historical data on the first releases are not available.

3.3. Relationship with macroeconomic variables: a focus on the euro area

This section elaborates on the relationship of the different labour cost variables with core inflation and nominal private consumption growth at the quarterly level. Again the analysis is restricted to the euro area. Data for euro area core inflation begin from 1996Q1, while data for euro area private consumption are available from 1992Q1. Moreover, while the series of *COMPE* and *NEGWA* start in 1992Q1, *ECFW* and the *LCI* are only available from 1995Q1 and 1997Q1 respectively.[18] For a

[18] For the euro area, national account data such as *COMPE* are not available before 1992Q1, because there is no data including united Germany prior to 1991 and the loss of observations for 1991 due to the calculation of year-on-year growth rates. Also note that there are two technical details that are often overlooked. First, exchange rate variations affect the data prior to 1999. The appropriate technique would be to re-calculate growth rates on the basis of weighted growth rates in national currency rather than taking Euro/Ecu data at the euro area level to

consistent comparison of indicators, the shortest wage series determines the length of the period of investigation. Given the lags in the equation and the choice of a common period where all labour cost indicators and relevant macroeconomic variables are available, the econometric analysis is conducted for the period 1997Q1 to 2006Q1.

It should be noted at the onset that the short length of the sample could reduce the reliability of the results. The result is based on only few observations, i.e. 38 observations.

3.3.1. Methodology

In order to exhibit the information content of the wage indicator in the monitoring of macroeconomic variables (inflation and private consumption), we test the forecast accuracy of a single equation including different wage indicators, taking a simple AR process as a benchmark. Two econometric exercises are carried out, i.e. in-sample forecasts and out-of-sample forecasts. This helps to recognize whether the use of wage indicators "beats" the autoregressive benchmark forecast derived from a simple univariate equation (where only lagged variables of the macroeconomic dependent variables and a constant are included). This exercise also allows one to derive which labour cost indicator has the tighter link to inflation and private consumption.

We first estimate a standard autoregressive process (AR):

$$\mu(L)I_t = c + \varepsilon_t \qquad \text{(model 1)}$$

and an Autoregressive Distributed lag equation ADL(p,q):

$$\mu(L)I_t = \delta(L).L.W_t + c + \varepsilon_t \qquad \text{(model 2)}$$

where I_t, W_t,, $\mu(L)$, $\delta(L)$ and c respectively denotes the macroeconomic variables of interest (HICP excluding unprocessed food and energy and private consumption), the labour cost indicators, lag polynomials of order p and q, and an intercept. ε_t is a white-noise process. The lag operator L in model 2 suggests that the wage indicator W is lagged by at least 1, so as to use it as a predictor of I. As I and W are non stationary (and W not always seasonally adjusted), we take their year-on-year quarterly rates of growth.[19] For the sake of simplicity, the year-on-year growth rate of HICP excluding unprocessed food and energy is called "core inflation" here.

Following the literature on forecasting euro area equations (e.g. Runstler and Sédillot 2003, Moser et al 2005, Marcellino et al. 2001), we use both in-sample one-step forecast and out-of-sample one-step forecast. For the in-sample forecast, we use the RMSE and a Wald F-test $\delta(L)=0$ on the statistical significance of the wage indicator in model (2). For the out-of-sample forecast, we utilise the standard statistics of model comparison, which are the out-of-sample forecast RMSE and the Diebold-Mariano (1995) statistics of compared predictive accuracy.

In both in-sample and out-of-sample forecasts, we also use the descriptive statistic for the gain in forecasting accuracy of model 2 against model 1 (*Gain*), which can be expressed as the ratio of the mean square errors (with the inverted sign).

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calculate growth rates. Secondly, data is distorted by a statistical break in the compensation series of Italy in 1998. Here the standard practice consists in extrapolation of the distorted values.

[19] HICP excluding unprocessed food and energy, private consumption and W are supposed to be I(1), especially in the studied period, as widely documented in the literature. However, some economists claim that price indices are I(2) over a longer period.

$Gain_{2/1} = \frac{MSE_1 - MSE_2}{MSE_1} = \frac{RMSE_1^2 - RMSE_2^2}{RMSE_1^2}$, where MSE_1 and MSE_2 are the respective mean square errors of model 1 and 2 and $RMSE_1$ and $RMSE_2$ the respective root mean square errors of model 1 and 2. The literature on forecasting (e.g. Marcellino et al. 2000) suggests as a rule of thumb that a model could be said superior in terms of predictive accuracy if the gain statistics above exceeds 10%.

The Diebold-Mariano statistics consists in testing if two models significantly differ in their predictive capacities, say, if they display significantly different mean square forecast errors:

$\bar{d} = \frac{1}{n}\sum_{t=1}^{n} d_t = RMSE_2^2 - RMSE_1^2$ with $d_t = \varepsilon^2_{2t} - \varepsilon^2_{1t,}$

where ε^2_{1t} and ε^2_{2t} the respective squared forecast errors of model 1 and 2 and $RMSE_1$ and $RMSE_2$ the respective root mean square errors of model 1 and 2. An adapted version of the Diebold-Mariano statistics is used here, which takes an unbiased empirical estimate of the variance in finite samples:

$$DM = \sqrt{n-1}.\frac{\bar{d}}{\hat{\sigma}_d^{\,2}} = \frac{1}{n-1}\sum_{t=1}^{n}(d_t - \bar{d})^2 \rightarrow T(n-1) \text{ where } \hat{\sigma}_d^{\,2} = \frac{1}{n-1}\sum_{t=1}^{n}(d_t - \bar{d}_t)^2$$

The Diebold-Mariano statistics, given by the gap between the mean squared errors of the two models scaled by the standard deviation of *d*, follows a Student distribution with *n-1* degrees of freedom, denoted *T(n-1),* where *n* is the number of forecast quarters. However, it should be borne in mind that this simple and easily calculable version of Diebold-Mariano statistics tends to have a low power and to reject the true null too often, especially in a multi-step forecasting framework. This is not an issue here, as we deal with one-step forecasting (i.e. one quarter ahead). Therefore the correction in the Student statistics recommended by Harvey, Leybourne and Newbold (1997) for small samples in a long-horizon forecast does not appear necessary in this case. However, the estimate of the variance of *d,* $\hat{\sigma}_d^{\,2}$, could be slightly biased by neglecting the autocorrelation of *d.*[20]

The null hypothesis H_0 is that models 1 and 2 do not exhibit any difference in forecast accuracy, while the alternative hypothesis H_a is that model 1 is superior to model 2 (if $d>0$) or model 2 is superior to model 1 (if $d<0$). Models are compared at a confidence level of 90% and 95%.

3.3.2. Link to core inflation: a supply-side perspective

As regards the forecasting of core inflation, measured by growth in HICP excluding unprocessed food and energy, Benalal et al. (2004) find that the aggregation of country forecasts does not improve upon the direct forecast for the euro area as a whole. This gives support to our euro-wide approach. All the wage indicators are only weakly correlated with inflation[21]. The choice of HICP

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[20] An unbiased estimated of variance would be: $\hat{\sigma}_d^{\,2} = \gamma_0 + 2\sum_{t=1}^{n}\gamma_t$ with $\gamma_t = \text{cov}(\gamma_t, \gamma_{t-j})$, which is often used in the calculation of Diebold-Mariano statistics We will ignore these more complex specifications, only bearing in mind that the Diebold-Mariano statistics used here is likely slightly overestimated, leading to a "spurious" rejection of the test.

[21] As regards COMPE, it could be recommended to take the non-market sectors out, given their different and less obvious impact on HICP than the private sector. However, wage slippages in the non-market related service could deteriorate budgetary conditions, possibly exerting (delayed) upward pressures on administrative prices and

excluding unprocessed food and energy is justified by the fact that headline HICP inflation was rather volatile in the last years, being markedly influenced by energy prices and short-term effects caused by unprocessed food prices.

For the benchmark estimate, the first and third lags of core inflation turn out to be significant. The third lag is selected as the one minimising both the Akaike information criterion and the Schwarz criterion. We also make sure that the residual does not display any serial correlation, which could bias the estimates.

The in-sample (static) forecast suggests that the inclusion of any labour cost indicator improves the accuracy of the forecasts, as seen in Table 5. This is confirmed by the F-test, which is significant at 5% for all variables. Looking further, the gain statistics indicate that *LCI* is most tied to core inflation, while *COMPE* seems the least related and *ECFW* and *NEGWA* perform fairly well. The lag of the wage indicator is of 3 quarters for *COMPE* and *LCI*, meaning that labour cost developments take some time before feeding through core inflation.

However, using composite indicators raises the gains in forecast accuracy. This confirms the idea that a set of indicators appears preferable to a single indicator to follow short-term developments in inflation. While the composite indicator associating *COMPE*, *LCI* and *ECFW* or *COMPE*, *LCI* and *NEGWA* improves significantly the forecasting accuracy over single labour cost indicator, the composite indicator N°2 (including *NEGWA* and *LCI*) seems to rank first, with a 1%-level significance of the F test. Apparently, such an approach suffers from the availability of relatively short time series. For most data, there are less than 40 observations. Therefore, it seems crucial to check how labour costs improve the accuracy of out-of-sample forecast.

Table 5: Performance of in-sample forecasts (1996Q4-2006Q1) using wage indicators.
(forecast variable: Euro Area HICP inflation excl. energy and unprocessed food)

Inclusion of wage indicators in AR forecasts	RMSE	Gain (%)	Wald F-test $\delta(L)=0$	p-value	Lag of wage indicators	Rank Gain
Benchmark: AR(3)	0.156	0.0				
COMPE	0.147	11.2	4.9	(0.036)**	3	7
LCI	0.137	22.9	6.2	(0.021)**	3	4
NEGWA	0.142	17.1	6.4	(0.016)**	1	5
ECFW	0.142	17.1	6.2	(0.018)**	2	5
Composite 1 (COMPE,LCI,NEGWA)	0.135	25.1	3.9	(0.019)**	3 (COMP,LCI) and 2 (NEGWA)	2
Composite 2 (LCI,NEGWA)	0.134	26.2	6.1	(0.006)***	3 (LCI) and 2 (NEGWA)	1
Composite 3 (LCI,NEGWA,ECFW)	0.135	25.1	4.1	(0.015)**	3 (ECFW,LCI) and 2 (NEGWA)	2
*Benchmark AR(3)equation (OLS): HICPEX = 1.044*HICPEX(-1) + 0.271*HICPEX(-2) - 0.469*HICPEX(-3) + 0.257*						
		(6.9)	*(1.2)*	*(-3.2)*	*(2.5)*	

*Note: * ** Test significant at 10% and 5% respectively*.

The out-of-sample forecasts over the very recent period (2004Q3-2006Q1) broadly confirm the results of the in-sample forecasts. In Table 6, the rank of the wage indicators in terms of predictive accuracy gain is similar to that in Table 5. The *LCI* as well as the *ECFW* indicators perform particularly well, substantially reducing the mean square errors. The Diebold and Mariano test suggests that their forecasting abilities significantly differ from the autoregressive benchmark

indirect taxes. Moreover, computing a market-related compensation per employee would require some methodological assumptions (e.g. using fix or moving rates to aggregate the relevant sectors) and it is not always possible. Tentative results also show that the gain in predictive accuracy is not substantial.

forecast at 10% level. Having recourse to the composite indicator N°3 (*LCI*, *NEGWA* and *ECFW*) improves even further the forecasting accuracy in terms of gain statistics, although the Diebold and Mariano test does not reject the null of no predictive superiority. However, *COMPE* does not appear to have leading properties with a view to monitoring core inflation, which is line with the lowest rank that this indicator gets as regards the gain in predicting accuracy.[22]

Table 6: Performance of recursive out-of-sample forecasts (2004Q3- 2006Q1) with wage indicators
(forecast variable: Euro Area HICP inflation excl. energy and unprocessed food)

Inclusion of wage indicators in AR Forecasts	RMSE	Gain (%) compared with AR(3)	Predictive accuracy DM test	Rank Gain
Benchmark: AR(3)	0.150	0		
COMPE	0.163	-19	0.88	7
LCI	0.098	57	-1.55*	2
NEGWA	0.123	33	-0.53	5
ECFW	0.106	50	-1.99**	4
Composite 1 (COMP,LCI,NEGWA)	0.129	26	-0.63	6
Composite 2 (LCI,NEGWA)	0.099	57	-1.36	3
Composite 3 (LCI,NEGWA,ECFW)	0.095	59	-1.25	1

*Note: * ** Test significant at 10% and 5% respectively*.

3.3.3. Link to private consumption: a mixed supply- and demand-side perspective

While wage could influence private consumption by affecting total household disposable income, the sign and magnitude of this effect are far from evident. Indeed, total household disposable income greatly depends upon the labour income, i.e. the total wage bill, which can be decomposed as the product of average wage per employee and the total number of employees. While wage increases mechanically raise the disposable income of those employed, increasing wage also means higher labour costs and then (with some lags) lower employment, which in turn contributes to depressing consumption. In addition, lower employment might lead to raising unemployment rate, which often results in increasing precautionary savings and falling private consumption. By and large, the overall impact of wage on consumption is the result of a positive per-employee income effect and a negative employment effect.

For the benchmark autoregressive estimates, only the first lag is selected as it minimises the Schwarz criterion. When included in the benchmark, the sign of wages is negative in all equations. This suggests that the adverse effect on employment would dominate. Although this piece of evidence does not suffice to draw any firm conclusion, which would anyway be far beyond the scope of this paper, it signals the complexity of the empirical relationship between private consumption and wages.

The performance of the in-sample (static) forecast suggests that *COMPE* adds useful predictive information. This is seen through the important gain of predictive accuracy and the significance at 5% of the Diebold-Mariano statistics. The other indicators do not add much in this respect. *LCI* displays a high gain in MSE but it is not significant according to the Wald test.

[22] The gain in forecasting accuracy is even negative, although not significant according to the Diebold and Mariano test.

Table 7: Performance of in-sample forecasts (1996Q4- 2006Q1) using wage indicators.
(forecast variable: Year-on-year growth in Euro Area private consumption in constant price)

	RMSE	Gain (%) compared with AR(1)	Wald F-test δ(L)=0	P-value	Lag of wage indicators	Gain rank
Benchmark: AR(1)	0.67	0				
COMPE	0.59	23	4.15**	(0.048)	1	2
LCI	0.57	28	2.17	(0.15)	1	1
NEGWA	0.65	6	0.77	(0.39)	1	3
ECFW	0.65	5	1.82	(0.18)	1	4
Composite (COMPE,LCI,NEGWA)	0.71	-13	1.22	(0.31)	1	5
*Benchmark AR(1) equation (OLS): PRIV-CONSUM = 0.690*PRIV-CONSUM(-1) + 0.558*						
		(7.5)		*(3.0)*		

*Note: * ** Test significant at 10% and 5% respectively.*

The outcomes of the out-of-sample forecasts are quite disappointing. Except *COMPE*, which brings about no loss in forecasting accuracy, all indicators give even worse results in terms of RMSE than the simple AR(1). However, the Diebold-Mariano statistics does not support the null hypothesis that the MSE of the models with wages is significantly different from the benchmark autoregressive process.

Table 8: Performance of recursive out-of-sample forecasts (2004Q3- 2006Q1) with wage indicators
(forecast variable: year-on-year growth in Euro Area private consumption in constant price)

	RMSE	Gain (%) compared with AR(1)	Predictive accuracy DM test	Gain rank
Benchmark: AR(1)	0.687	0		
COMPE	0.690	-1	0.01	1
LCI	0.793	-33	0.48	4
NEGWA	0.730	-13	0.19	2
ECFW	0.743	-17	0.24	3
Composite (COMPE,LCI,NEGWA)	0.932	-84	0.20	5

*Note: * ** Test significant at 10% and 5% respectively.*

The disappointing results might be due to the small size of the sample and missing variables such as employment growth and the labour market uncertainty embedded in the unemployment rate. However, the results are not much affected if we take private consumption per person employed as the dependent variable, instead of total private consumption. The fact that *COMPE* is the indicator most closely linked with private consumption, albeit loosely, might be explained by two reasons. First, *COMPE* and private consumption are both national account concepts. Second, as *COMPE* measures the labour costs and not the household labour earnings, it is more adapted to capture the adverse effect on employment which seems to dominate over the per-person earning effect in the considered sample.

Box 4: A wage indicator for the Central and Eastern European countries (CEEC-8).

The ECFIN wage indicator (*ECFW*) has been built up for the euro area and the EU-15 aggregate, but not yet for the EU-25. While the information from an EU-25 aggregate may not be particularly telling, it may nevertheless be informative to have an aggregate indicator of the eight EU-10 countries, i.e. excluding Malta and Cyprus. They all display strong wage growth, backed by considerable improvements in productivity. In contrast to most of the EU-15 countries, wage setting takes place at a decentralised level in most of the EU-10 countries. Though the suitable analysis needs to be carried out at the country level, their commonalities could justify having an aggregate presentation for this group of economies. Data availability is not a big issue since most countries report quarterly data as early as or even earlier than the old Member States. It is, nevertheless, important to note that developments in Poland would dominate such an aggregate because it makes up almost 50% of the GDP and employment in the EU-10. Also note that most of the data concerns labour costs per head. Forming an EU-25 aggregate would therefore yield a less coherent indicator than currently the case for the EU-15 and euro area.

Graph B.4.1 uses the available quarterly wage data at national level and compiles the information into an EU-10 aggregate quarterly wage indicator. Since countries grew dynamically in the period under inspection, different aggregation weights were tried. It turned out that the information of the indicator changes marginally, except if 2004 instead of 2000 weights are used. The Table and Graph B.4.2 compare the information of the new indicator with the information from Eurostat's hourly labour costs (*LCI*), which was constructed as a GDP weighted average of the countries. Since observations differ strongly in early periods, it might be opportune to focus the comparison on more recent observations (lower panel in the table). *ECFW* has the lowest average growth rate. This is due to the facts that it covers the whole economy and refers to wages per person rather than per hour worked as the *LCI* (see Table A3 in the annex for the national series used). Standard deviations suggest that *ECFW* has the lower volatility. In a quarter of all observations, all three indicators pointed into the same direction (Graph B.4.3).

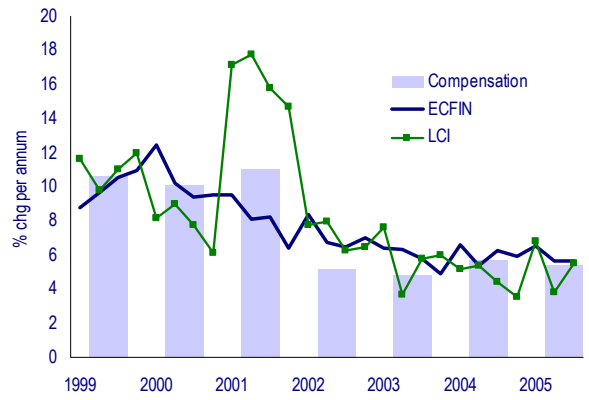
Graph B.4.1: **ECFIN quarterly wage indicator for EU-10 (excl. CY and MT)**

Source: Commission services.

Table: Descriptive statistics

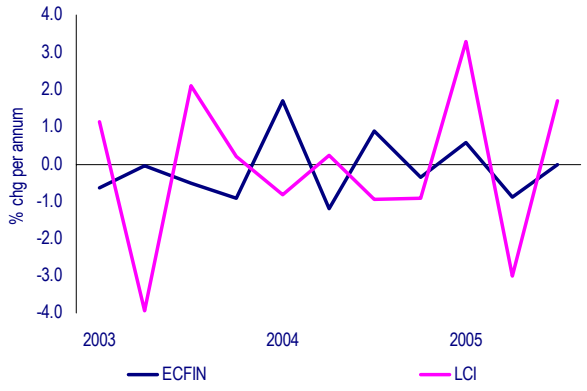
	ECFW	LCI
	1999Q1-2005Q3	
Average	7.7	8.4
Standard deviation	1.97	4.00
Autocorrelation	0.86	0.71
	2002Q1-2005Q3	
Average	5.9	5.3
Standard deviation	0.51	1.25
Autocorrelation	-0.19	-0.30

Graph B.4.2: **EU-10 (excl. CY and MT) quarterly wage indicators in comparison**



Source: Commission services.

Graph B.4.3: **Direction of change of harmonised quarterly CEEC-8 wage indicators**



Source: Commission services.

4. OVERALL ASSESSMENT

Progress with labour cost indicators in terms of timeliness and accuracy has been considerable since the introduction of the euro. Nevertheless, there are indications that policy makers still feel uncertain about the information on actual labour cost developments, especially at the intra-annual frequency. The high observed volatility of the data, the considerable size of data revisions and conflicting signals from the different available indicators witness that the assessment of short-term labour cost developments is still subject to a sizeable degree of uncertainty.

When comparing conceptual and methodological criteria such as timeliness, coverage, availability of breakdown and consistency, it is found that each indicator has its advantages and disadvantages. Table 7 summarises the information on the assessment of the different indicators in form of a ranking per criteria.[23] It should be borne in mind that the comparison and ranking of different indicators are mostly based on objective information on the indicators, but imply some judgmental analysis in some cases.

- Non-harmonised indicators at the Member State level tend to be the timeliest, while harmonised indicators at the EU level such as *COMPE* and *LCI* (currently under harmonisation process) have the advantage of allowing a decomposition by type of labour costs (wages and non-wage costs) and by main sectors. From a methodological point of view, they are better suited to provide consistent information on quarterly labour cost developments at the euro area or EU-15 aggregate level.
- Nevertheless, the aggregation of non-harmonised wage data into euro-area time series yields information that, according to the analysis in this paper, does not perform systematically worse than harmonised indicators especially in terms of links to relevant macroeconomic variable such as core inflation.

It should be stressed that the conceptual and statistical differences between the existing wage indicators are a welcome feature *per se*. Indeed, if they were highly correlated between each other, only one of them would be really needed and their information content would be poorer. Lastly, the choice of the most relevant labour cost indicators hinges very much upon the macroeconomic variable of interest. For instance, the ability of a labour cost indicator to forecast core inflation is definitely different from that to predict private consumption growth.

The ex-ante analysis of indicator properties suggests that *COMPE* is the most comprehensive (covering all sectors) and complete (covering all types of labour costs including non-wage costs) indicator to assess labour cost pressures. It is also the most harmonised indicator, as it complies with the requirements of national account regulations in terms of cross-country comparability and consistency with the other macroeconomic variables. The importance of its revision signals that any new information is taken on board by Eurostat to refine the first estimate. Although its abilities of predicting inflation one-quarter ahead is clearly mediocre compared with the other indicators, it sounds the best leading wage indicator of private consumption, albeit not very powerful. Its information should be completed by the ECB indicator of negotiated wages (*NEGWA)*, characterised by a noticeable stability and which indicates the wage pressures coming from the wage bargaining process and the possible risk of second-round effect. Although the indicator of hourly labour costs (*LCI*) is far from perfect given its strong volatility often complicating its interpretation and the difficulty of measuring hours worked on a quarterly basis, *LCI* is currently

[23] "1" in the table means that the indicator is the best with respect to the criterion, while "4" means it is the poorest. No ranking was allocated to the criterion of revisions because it is ambiguous whether the absence of revisions should be given a positive or a negative value. Moreover, the magnitude and size of revisions can be expected to be strongly dependent on the timeliness of an indicator. Apparently, no single indicator dominates and the relative favourability of each depends on the weights any analyst would attach to each criterion.

going through a process of improvement and harmonisation and appears the best wage indicator to predict short-term developments in core inflation (one quarter ahead). Moreover, the relevance of the concept of hourly labour costs, less subject to compositional effects and in particular to changes in working time, makes *LCI* particularly useful when assessing wage trends in the medium run (say, over a period of one or two year), which are less affected by short-term volatility.

Table 9: Ranking of quarterly wage indicators according to different statistical criteria

	Nominal compensation (COMPE) (National accounts)	**Hourly labour cost index (LCI)** (Eurostat)	**National indicators, ECFIN indicators (ECFW)** (National sources)	**Euro-area negotiated wages (NEGW)** (ECB)
		Ex ante criteria		
Timeliness	4	3	2	1
Comprehensiveness				
- sectoral coverage	1	3	2	3
- dimension availability	1	2	3	3
- country availability	3	2	1	14
Harmonisation				
- at national level	1	3	1	4
- at aggregate level	1	2	4	3
Availability of breakdown				
- sectors	2	1	3	4
- components	2	1	2	4
		Ex post criteria		
Low volatility	3	4	2	1
Small data revisions	2	4	3	1
		Relation with macroeconomic variables*		
Link with core inflation	4	1	2	3
Link with consumption	1	2	4	3

* Based on the performance of in-sample forecasts one-step ahead (Table 5 and 7).

Moreover, the analysis suggests that the different available wage indicators rarely point into the same direction. For the euro area since the introduction of the euro, this has been the case in 12% of all quarterly observations. In addition, when forecasting core inflation one-step ahead, the composite indicators (encompassing at least two indicators such as *NEGWA* and *LCI*, appear clearly superior compared with any single wage indicator. Overall, although more weight should be placed in *COMPE* given its comprehensiveness and its degree of harmonisation, the paper clearly highlights the need to base the assessment of short-term wage developments on more than one single indicator, with the use of the largest possible set of indicators allowing for the most accurate assessment.

In the evaluation exercise, *ECFW* fares better than expected. While it does not allow for consistent cross-country comparisons and mixes hourly and per head data, its track record in the past was reasonably good. That is, it is less volatile and timelier than the more harmonised indicators. Its correlation with other macroeconomic variables (core inflation and private consumption growth) is relatively high, which makes it suitable for short-term macroeconomic analysis. Nevertheless, the treatment of missing variables led to a bias, i.e. revisions tended to be downwards in times of accelerating wage growth and upwards in periods of receding wage growth. While the value-added

of an EU-25 wage aggregate indicator is questionable given the labour market disparities between EU15 and EU10, it is possible to calculate a reasonably good quarterly wage indicator for the aggregate of the eight CEEC countries.

Overall, although the comparison and ranking of different indicators as provided in the paper imply some judgment in some occurrences, which might be subject to discussion, all users of euro area / EU wage statistics should benefit from more in-depth information on their properties and would greatly gain from further improvement in the timeliness of the available indicators.

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ANNEX 1: MORE DETAILED INFORMATION ABOUT THE INDICATORS IN USE

1. Labour cost index

Eurostat's hourly labour cost index (LCI) was created in order to monitor wage developments on the basis of a harmonised concept. In order to arrive at internationally comparable data, a legal framework at the EU level was established, which rules compilation and coverage of the labour cost index. As defined in Commission Regulation (EC) No 1726/1999 of 27 July 1999, labour costs include employee compensation, with wages and salaries in cash and in kind, employers' social security contributions and employment taxes regarded as labour costs minus any subsidies received. Excluded are vocational training costs or other expenditure such as recruitment costs and spending on working clothes. The data are estimated by the National Statistical Institutes on the basis of available structural and short-term information from samples and administrative records for enterprises of all sizes.

As regards data availability, the following issues are notable.

- The data is displayed as an index series, in quarter-on-quarter and annual growth rates, working-day adjusted, in real and nominal values. For most countries, it is back cast to 1996.
- Currently, the LCI is available for almost all EU-25 Member States, Bulgaria and Romania as well as for the EU-25, EU-15 and euro area aggregate. Data for Greece is missing until 2005Q1 and Italian data is treated as confidential
- The LCI does not cover the whole economy (see Table A.1). Data is missing for the agricultural sector (NACE A-B) and for most countries for the non-market service sector (NACE L-P). The latter includes mainly public employment and represents around a third of total employment.
- Data is available for total labour costs, total labour costs excluding bonuses, wages and salaries and labour costs other than wages and salaries. A sectoral breakdown is available for NACE 1 sectors, except for those that are not yet covered (see above).
- Regulation (EC) No 450/2003 requires the Member States to deliver harmonised and fully comparable data from the first quarter of 2005 onwards. As several countries are not completely complying with its provisions, currently available data are not yet fully harmonised. However, all official derogations ended in 2005 and the methodological improvements introduced in summer 2005 led to a considerable revision of the time series.[24]
- The LCI is released about 2 and a half month after the end of a quarter, i.e. the first publication for 2005Q4 took place on 17 March, with a second release usually following about a month later. In practice, data are subject to sometimes large revisions and never considered final.

[24] Since then, considerable progress has been accomplished. For example, new estimates of actual hours worked or hours paid rather than persons employed, inclusion of small enterprises, more complete coverage of market services, chain-linked rather than fixed base index.

Table A.1: Availability of the hourly labour cost index in Eurstat

	Coverage[1)]	Publication lag [2)]	Average annual growth rate [3)]	Coefficient of variation [3, 4)]
BE	Excluding non-market services	t-4	3.1	0.5
CZ	Total economy	t	7.2	0.4
DK	Excluding non-market services	t	3.7	0.2
DE	Excluding non-market services	t	2.2	0.4
EE	Excluding non-market services	t	9.9	0.3
EL	Provisional index under construction, but not yet validated by Eurostat			
ES	Excluding non-market services	t	4.6	0.2
FR	Excluding non-market services	t	3.7	0.3
IE	Excluding non-market services	t-1	5.6	0.3
IT	not published due to provisional character of data			
LU	Excluding non-market services	t	5.4	0.2
CY	Total economy	t	8.2	0.4
LV	Excluding non-market services	t	4.1	1.2
LT	Excluding non-market services	t	3.6	0.4
HU	Total economy	t-1	10.7	0.4
MT	Excluding non-market services		3.3	0.5
NL	Excluding non-market services	t-1	4.5	0.5
AT	Excluding non-market services	t	2.2	0.6
PL	Excluding non-market services	t	7.7	0.9
PT	Total economy	t	3.8	0.6
SI	Total economy	t	8.7	0.5
SK	Total economy	t	8.7	0.4
FI	Excluding non-market services	t	4.4	0.3
SE	Excluding non-market services	t	4.0	0.2
UK	Total economy	t	4.7	0.3

Notes: 1) excluding NACE sectors A and B (Agriculture; hunting and forestry; fishing), 2) relative to EU quarterly national accounts), 3) 1999Q1- latest observation, 4) Standard deviation divided by average.

Source: Commission services.

So far, the LCI has not yet acquired the position of a benchmark for labour cost developments. To some extent, it was due to the existence of derogations, which imply that the LCI is not yet a fully harmonised concept that covers the whole economy. To some extent, volatility and large revisions of the time series in the past may have undermined the perception of the LCI providing reliable data.

2. Compensation per employee

Compensation per employee (*COMPE)* can be calculated from the series nominal compensation of employees and number of employees in the national accounts, directly aggregated by Eurostat for the euro area and EU15[25]. Compensation of employees is defined as the total remuneration, in cash or in kind, payable by an employer to an employee in return for work. It is broken down into wages and salaries and employers' social contributions. The most notable difference to the *LCI* concerns the denominator. Hours worked are currently not available in the quarterly national accounts. *COMPE* is therefore expressed per employee (domestic concept) whereas the *LCI* gives labour costs by hour.

- The data is available in seasonally adjusted levels. Hence, quarter-on-quarter growth rates can be compiled as well as annual growth rates. Although the series starts in 1992 (levels), the euro-area data before 1999 are distorted by variations in exchange rates.[26]

[25] Before autumn 2002, when the aggregate was not available from Eurostat, the ECB was publishing its own aggregate of the national account series at the level of the euro area.

[26] Moreover, a statistical break was implemented in Italy that distorts the 1998 observation of this country and the euro area aggregate.

- The series covers the euro area, the EU-15 and in principle all EU-25 Member States. In practice, Eurostat calculates aggregates once 60% of the weight of a variable is available. However, not all countries deliver quarterly compensation or employee data or national accounts data at all (see Table A.2). Concerning the larger countries, information is currently not available for Poland and since 2004Q3 for France.
- The indicator includes the whole economy. A breakdown is available for six broadly defined sectors (NACE AB, CDE, F, GHI, JK, L-P). Not yet available is a breakdown at the quarterly level of compensation into wages and salaries on the one hand and employers' contribution to social security on the other hand.
- Definitions and coverage are governed by the regulations that rule the establishment of national accounts. Data is therewith harmonised across countries to the extent that the reporting of national accounts data is harmonised.
- Euro area figures are released with the second release of national account data, which takes place about three and a half month after the end of a quarter. Thus, it broadly coincides with the second release of the LCI.

Table A.2: Availability of the quarterly compensation per employee

	Availability [1)]	Average annual growth rate [2)]	Coefficient of variation [2, 3)]
BE	T	2.7	0.4
CZ	t, unadjusted	7.4	0.3
DK	t-1, unadjusted: t	3.9	0.2
DE	t-1, unadjusted: t	1.2	0.6
EE	t-2, unadjusted: t-1	10.2	0.2
EL	#N/A	#N/A	#N/A
ES	T	3.1	0.2
FR	t-5	2.7	0.1
IE	#N/A	#N/A	#N/A
IT	t-1	2.6	0.4
LU	#N/A	#N/A	#N/A
CY	#N/A	#N/A	#N/A
LV	t-1, unadjusted from 2003	14.4	0.2
LT	t, unadjusted	4.8	1.7
HU	#N/A	#N/A	#N/A
MT	t, unadjusted	3.8	0.6
NL	t, unadjusted	4.2	0.5
AT	t	2.1	0.2
PL	#N/A	#N/A	#N/A
PT	#N/A	#N/A	#N/A
SI	#N/A	#N/A	#N/A
SK	t-1	8.0	0.3
FI	t	3.2	0.4
SE	t, unadjusted	3.8	0.5
UK	t-1	4.7	0.2

Notes: 1) relative to quarterly national account information in January 2006, working-day adjusted unless otherwise specified, 2) 1999Q1- latest observation, 3) Standard deviation divided by average.

Source: Commission services.

COMPE is often seen the standard indicator for assessing wage developments. ECFIN has referred to this series in most of its publications and notes, including the forecast, the EU economy review, the Quarterly Report on the euro area or the inflation report. The series is also used for the compilation of price and cost competitiveness indicators (real effective exchange rates). Commentaries, however, mainly focus on annual developments or at the euro-area aggregate level. The large number of missing observations for individual countries makes the concept currently less suitable for comprehensive short-term monitoring purposes.

3. Non-harmonised data on average earnings and labour costs

Earnings indices, which differ from compensation and labour costs by not including employers social security contributions, used to be available for the whole economy and industry, at quarterly frequency and in seasonally adjusted terms. However, their interest is to some extent historical now, as Eurostat discontinued publishing these series with EU enlargement because of their total lack of harmonisation, the absence of legal basis and the wish of focusing on and improving *LCI* embedded in the adoption of the Regulation 450/2003. Nevertheless, data on private sector earnings are still available for most countries and for a euro-area aggregate from the OECD. Moreover, they play a role in monitoring country-specific developments. Earnings data from some countries are used for the calculation of the ECFIN wage indicator.

Each of the used national series in the table below is considered to be a useful benchmark for national wage developments. A survey among country desks in ECFIN revealed that the national indicator was selected in most cased because it was the timeliest one, in several cases because it was most frequently quoted in national sources and only in three cases because it was the only available figure. As regards the new Member States, most country experts reasoned that the selected indicator was the only one available.

Table A.3: National indicators preferred by ECFIN country desks

	Indicator	Source	Release	Justification for use	Average [1)]	Coefficient of Variation [1)]
BE	Collectively agreed basic monthly pay of private sector wages and salaries	Ministry of Employment and Work	t + 2 months	only available	2.6	0.3
CZ	Average gross monthly wages	Czech Statistical Office	t + 2 months	only national indicator available	7.2	0.2
DK	Indices of average earnings in the private sector (total)	Danmarks Statistik	T + 2 months	most timely, most used	3.6	0.2
DE	negotiated wages on an hourly basis	Bundesbank	M + 70 days	most frequently quoted	2.1	0.3
EE	Average hourly gross wages (salaries),	Statistical Office of Estonia	Q + 50	only available	10.4	0.2
EL	Average monthly labour cost	National Statistical Services of Greece	Q + 3 months	only available	6.0	1.0
ES	LCI survey Labour Cost	National Statistics Institute (INE)	T + 70 days	most timely with sufficient coverage	3.7	0.2
FR	Gross wages per employee (COMP) divided by the average hours worked per employee, whole economy excl. agriculture	INSEE, Labour Ministry (ACEMO survey)	Month + 6 weeks	most timely with sufficient coverage	3.6	0.4
IE	Wages and salaries per employee	Central Statistics Office	end of each third month	most timely	5.9	0.3
IT	Contractual wages (hourly)	ISTAT	end of third month	most timely and most quoted	2.3	0.2
CY	Labour Cost Index (LCI)	Statistical Service of the Republic of Cyprus, Eurostat	T + 90	most timely with sufficient coverage	8.2	0.4
LU	Monthly labour costs per employee, total economy ("Coût salarial par mois et par person, emploi salarié total ")	STATEC	T + 5 or 6 months e.g. Last available is December 2005 (on June 13 2006)	Monthly available ; covers the whole economy	3.6	0.4
LV	Average gross monthly	Central Statistical	t + 2 months		8.9	0.4

	wages and salaries	Bureau of Latvia				
LT	Average gross ad net earnings	Statistics Lithuania	t + 2 months	only available	6.3	0.4
HU	Average monthly earnings of employees	Hungarian Central Statistical office	t + 2 months	only available	11.9	0.4
MT	Compensation per employee, whole economy	National Statistical Office	Q + 3 months	most used, with sufficient coverage		
NL	Collectively agreed basic hourly wage rates	Centraal Bureau voor de Statistiek	Month + 2 weeks	most timely	2.8	0.4
AT	Compensation of employees of which wages and salaries	WIFO	T + 70	most frequently quoted	1.9	0.2
PL	Average monthly gross wage and salary	Central Statistical Office	t + 6 weeks	most frequently quoted and only		
PT	Contractual wage growth, based on weighted increase of settlements	Ministry of Labour and Social Solidarity	month +3 weeks	most timely with sufficient coverage	3.2	0.2
SI	Average monthly earnings	Statistical Office of the Republic of Slovenia	Month +50 days	only national indicator available	8.8	0.3
SK	Average nominal gross monthly wages of employees in economy	Statistical Office of the Slovak Republic	month + 6 weeks	only available	8.1	0.2
FI	Index of wage and salary earnings (whole economy)	Statistics Finland	Q + 1 ½ months	most frequently and quoted and only available	3.8	0.2
SE	Average hourly wage (blue-collar workers, private sector)	Statistics Sweden	9 weeks	leading indicator for inflationary pressure	3.2	0.2
UK	Average Earnings Index - including bonuses: Whole economy	Office for National Statistics	month +2 months	most timely with sufficient coverage and most frequently quoted	4.2	0.2

Note: 1) sample starts in 1991Q1 except 1999Q4 for UK, 2000 for EL, 2000Q3 for SE, 2001 for EE and ES, 2002 for HU, 2003 for LT.

As regards the old Member States, the national data stem mainly from statistical offices (DK, EL, ES, IE, IT, LU, NL, FI, SE, UK) and in some cases from ministries (BE, FR), central banks (DE, PT) and in one case a research institute (AT). In the new Member States, it is always the statistical office.

National data are not harmonised across countries. They differ in their definition (monthly/hourly wages; actual wages paid/collectively agreed wages) and their sectoral coverage (whole economy/private sector).

These different indicators have the advantage that normally they are earlier available than the "European" indicators. Moreover, they are more likely to reflect country-specific circumstances. As a summary index of national indicators, the ECFIN wage indicator has been used for a considerable time to assess wage developments in the euro area and EU-15. Its initial raison d'être was the non-availability of official indicators that cover the euro area. In terms of formulation and coverage, the following items are worth highlighting.

- The value-added of the ECFIN indicator is the aggregation of data for the euro area and the EU-15, which consist of GDP weighted average of growth rates of national wage series.[27] An extension to the EU-25 has not yet been implemented.

[27] Although a weighting scheme with employees or compensation would be more appropriate in theory, the difference in the outcome is marginal in practice. See Graphs 5 and 6.

- ECFIN's wage indicator is formulated as an annual growth rate with a quarterly frequency. An index or quarter-on-quarter growth rates are not computed. The time series goes back to 1995.
- The index for the euro area is typically available after two and a half month after the end of the quarter. A new quarterly observation is added when 50% of the aggregate are available. Usually, the underlying country-specific information is available for all Member States of the EU-15. Data for AT, EL and LU usually lags by one quarter. Often, the ECFIN indicator was available around two weeks before the publication of the LCI.

4. Negotiated wages

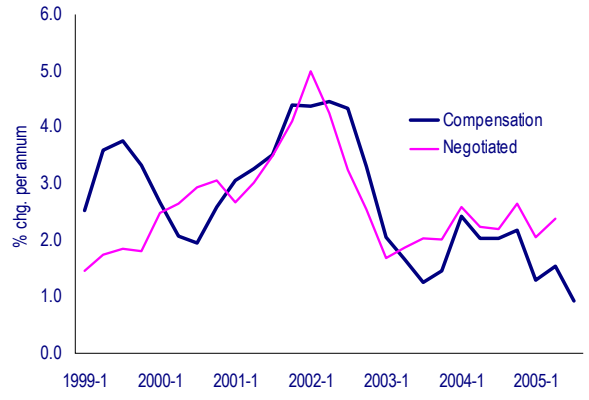
Since 2002, ECB has been compiling an indicator of negotiated wages for the euro area, based on non-harmonised national indicators. For most countries, this data captures developments in the non-agricultural business sector, i.e. excluding NACE sectors AB and L-P. This series seems to have some leading properties relative to actual wages. The graphs below suggest that this appears to be the case particularly for Belgium and Germany. For five countries, data on negotiated wages is used by ECFIN country desk as primary indicator for monitoring short-term wage developments, for three further countries there are indications that indicators of negotiated wages exist. However, for almost all new Member States, no such data is available. The exceptions seem to be Poland and Slovenia, where such information exists on annual basis.

Table A.4: Indicators of negotiated wages

Used in ECFIN wage indicator	BE, DE, IT, NL, PT
Exists	EL, ES, AT // SI and PL (Annual)
Unknown or not existing	CZ, DK, EE, FR, IE, CY, LV, LT, MT, HU, PL, FI, SE, UK

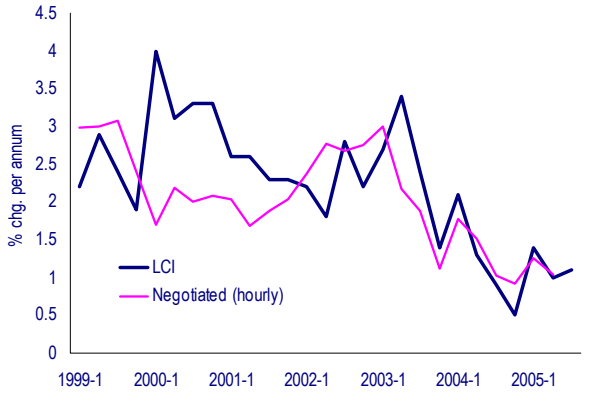
According to indications of ECFIN country desks.

Graph A.1: **Negotiated and actual wages in Belgium**



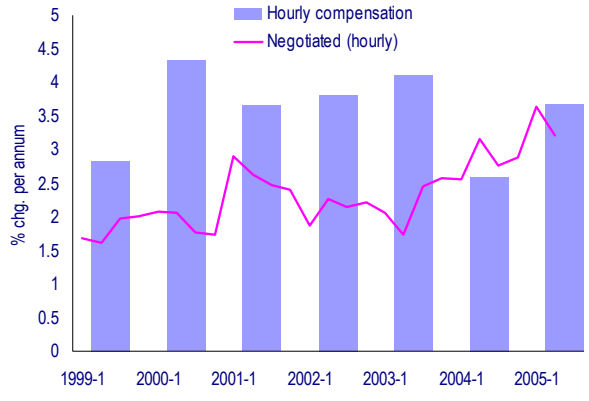
Source: Commission services.

Graph A.2: **Negotiated and actual wages in Germany**



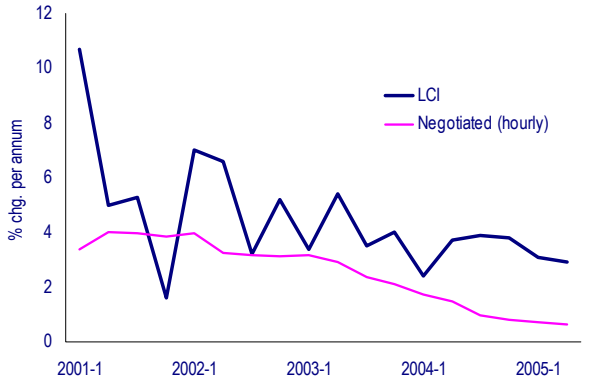
Source: Commission services.

Graph A.3: **Negotiated and actual wages in Italy**



Source: Commission services.

Graph A.4: **Negotiated and actual wages in the Netherlands**

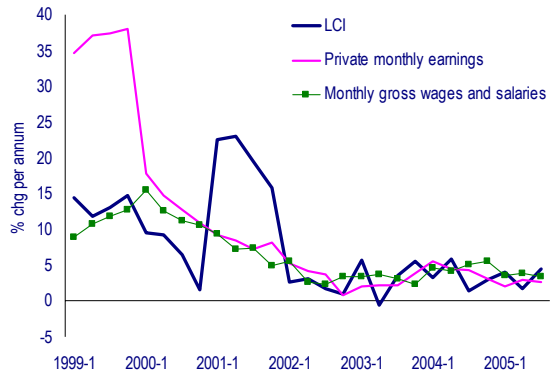


Source: Commission services.

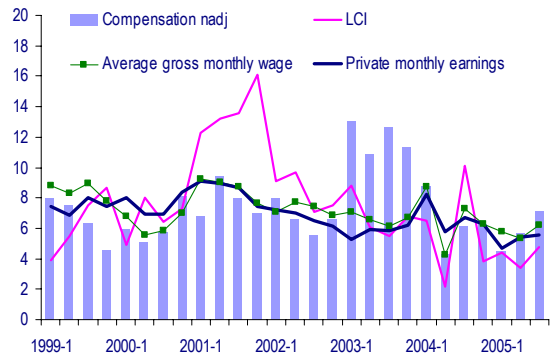
5. A comparison of wage indicators for the 8 CEEC

The graphs below plot the development of various wage series for the 8 Central and Eastern European economies. For all of these countries, more than 1 wage series is available at quarterly frequency. The comparison of their time profile suggests that they often display different signals and only in-depth analysis at the country level could reveal whether this is due to differences in coverage or statistical measurement problems.

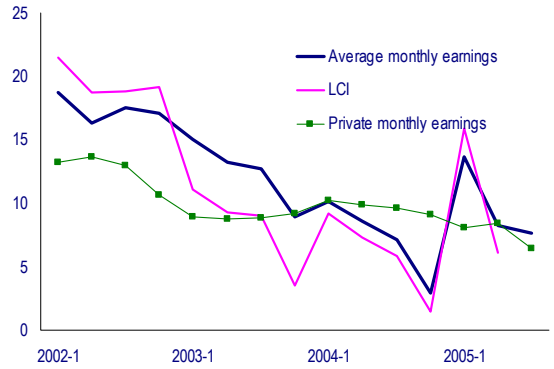
Graph A.5: **Quarterly wage series for Poland**



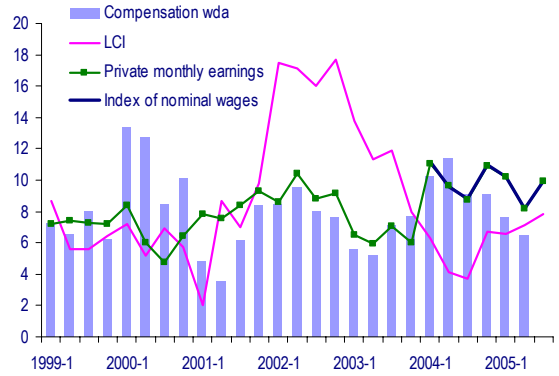
Graph A.6: **Quarterly wage series for the Czech Republic**



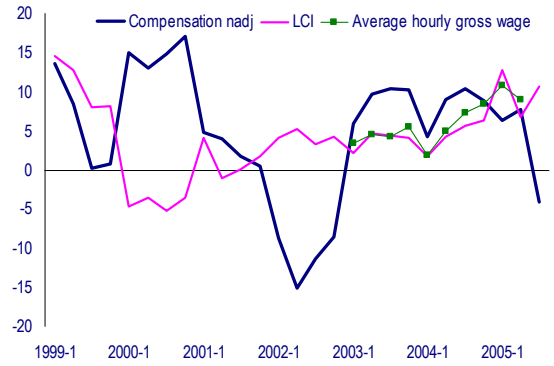
Graph A.7: **Quarterly wage series for Hungary**



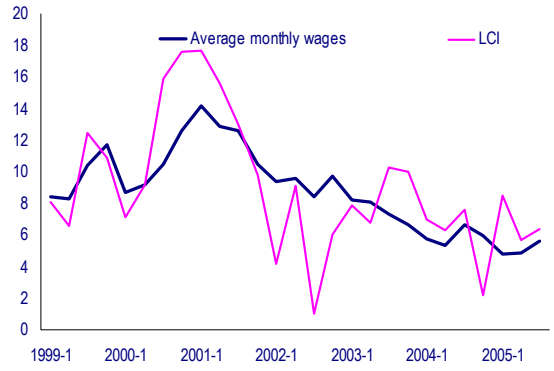
Graph A.8: **Quarterly wage series for the Slovak Republic**



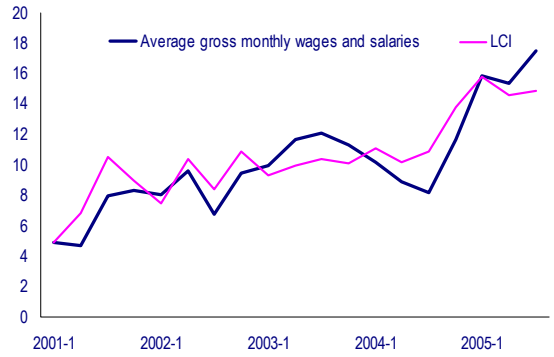
Graph A.9: **Quarterly wage series for Lithuania**



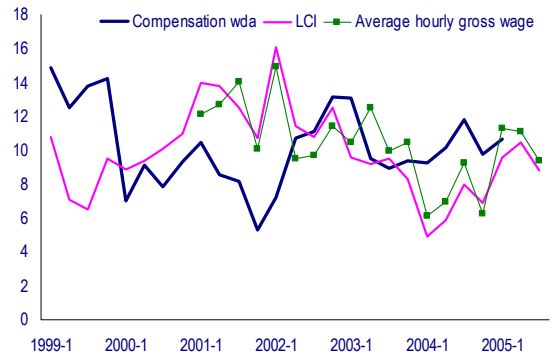
Graph A.10: **Quarterly wage series for Slovenia**



Graph A.11: **Quarterly wage series for Latvia**



Graph A.12: **Quarterly wage series for Estonia**



ANNEX II: POSSIBLE SCOPE FOR IMPROVEMENT IN THE ECFIN INDICATOR IN THE FUTURE

ECFIN launched an informal survey for the national delegates of the Labour Market Working Group (LMWG) attached to the Economic Policy Committee on their preferred wage indicator for their home country and their assessment of the country-specific indicators used in ECFIN wage aggregate for EU15. Building upon the replies by LMWG national delegates, the work of the authors and the expertise of ECFIN country desks, this annex points to room for improvement in the ECFIN wage indicator in two areas.

1. **Using more suitable series for some countries.** In the framework of the EPC's Labour Market Working Group, we invited the Member States to examine the ECFIN indicator, its components and more broadly the indicator used by the ECFIN country desk. Though most Member States confirmed that the indicator used by the ECFIN country desk were the most suitable ones, some Member States suggested using alternative indicators (see Table), which they considered to be more representative for labour cost developments in their home country than the indictors preferred by ECFIN country desks.

Table A.5: Suggested new indicators

	Indicator	Source	Release	Justification for use
DK	Quarterly hourly earnings indicator	Statistics Denmark and the Confederation of Danish Employers	Quarterly release t + 2 months	Sufficient coverage, good breakdown
EE	Monthly gross salary	Statistical Office of Estonia	Monthly release	Good breakdown, most frequently quoted
MT	Average gross annual salary for employees by economic activity	National Statistics Office	Quarterly release	Sufficient coverage
SE	Index of wage and salary earnings (whole economy)	Swedish National Mediation Office	Released 10 times per year t + 2 months	Leading indicator for wage developments in the whole economy

2. **Methodological changes.**
   - Currently, missing observations for the most recent period are treated as blanked, i.e. if information is available for 8 countries, the indicator gives the average annual growth rate for these 8 countries. Since the late-reporters had a stronger acceleration of wage growth in the upswing and a stronger deceleration in the last slowdown, this procedure yielded a systematic underestimation of wage growth in the upswing and overestimation in the downswing. In order to reduce this bias, we suggest using the latest available annual growth rate for all countries for which the most recent quarter is not available.
   - The weighting procedure applied to compute the aggregate ECFIN indicator might be revised, although this represents a second-order refinement. Instead of using GDP, we suggest having recourse to "total wages and salaries" (i.e. the wage bill) for a recent year (2004 or 2005) from the annual national account.
   - We have no suggestion to reduce the bias introduced by the fact that the national sources are not harmonised. There is no simply way to correct for the wedge per hour/per

employee or negotiated wages/actual wages. Note that the indicator of negotiated wages that the ECB publishes suffers from similar methodological shortcomings.

- The delegates in the Labour Market Working Group considered the compilation of an EU-25 aggregate of limited use, but thought it interesting to have an aggregate for the catch-up countries outside the euro area. Data availability and timeliness should not be an obstacle to the calculation of an EU-8 or EU-10 aggregate (excluding Slovenia once it enters the euro area).

ANNEX III: LIST OF EXPERTS WHOSE COUNTRY-SPECIFIC INPUTS OR COMMENTS ARE ACKNOWLEDGED

ECFIN country desk officers

BE	Gerrit Bethuyne
CZ	Marek Mora
DK	Jens Matthiessen
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EE	Helga Vogelmann and Karl Gradinger
EL	Nico Beinema
ES	Javier Yaniz-Igal and Gaspar Ros Moreno
FR	Hervé Piffeteau and Stéphanie Riso
IE	Zdenek Cech
IT	V.E.Reitano
CY	Polyvios Eliofotou
LU	Jean-Luc Annaert
LV	Kristine Vlagsma
LT	Luis Fau
HU	Johannes Kattevilder and Julia Lendvai
MT	Ivan Ebejer
AT	Monika Sherwood
PL	Michal Narozny
PT	Pedro Cardoso
SI	Mateja Peternelj
SK	Anton Jevcak
FI	Timo Hirvonen
SE	Jonas Fischer
UK	John Sheehy

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CZ	Kamil Galuscak
DK	Søren Hasselpflug
DE	Wolfgang Scheremet
EE	Sille Rossi
EL	Nicolas Kalatzis
ES	Javier Moral
FR	Cédric Audenis
IE	Anne Donegan
IT	Nicola Curci
CY	Elias Mallis
LU	Armande Frising
LV	Gunta Pinke
LT	Natalija Ziminiene
HU	Agota Scharle and Péter Elek
MT	Charmaine Portelli
NL	Tjerk Kroes
AT	Christian Hederer and Alfred Stiglbauer
PL	Krzysztof Kaczmarek
PT	Alda Rito and Cândida Soares
SI	Alenka Kajzer
SK	-
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